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**Cystitis****Orchi-epididymitis****Prostatitis****Urinose Abscesses**

and in all acute or chronic Inflammatory Processes  
of the Genito-Urinary System

# *Antiphlogistine*

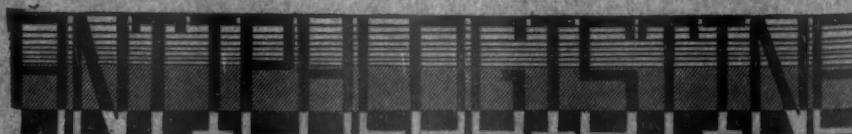
due to its stimulating and regenerative action, hastens repair, relieves swelling, reduces pain and is an efficient factor in the treatment.

Antiphlogistine possesses sedative and antiseptic properties, in addition to its ability to produce osmotic lavage, which is the mechanical phenomenon taking place in a membrane separated by two fluids of different molecular concentration.

*"Osmotic Lavage is far more beneficial than the superficial lavages, which never penetrate the membrane and merely produce a surface reaction."*  
*(E. Doumer, of the French Academy of Sciences.)*

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## Section of Epidemiology and State Medicine.

[April 25, 1930.]

### Some of the Clinical and Pathological Factors underlying Mortality-rates in Tuberculosis.

By Professor S. LYLE CUMMINS, C.B., C.M.G., M.D.

EPIDEMIOLOGICAL studies of tuberculosis are usually based upon mortality-rates, since these lend themselves well to statistical examination.

While the notification of cases continues to be so unsatisfactory as at present, incidence-rates, in this country at least, can only be regarded as extremely misleading, but death-rates are, within certain limits, fairly accurate, and their analysis has provided much valuable information. Especially valuable have been the analyses which, like those of the late Dr. Brownlee, have taken such a form as to suggest that, behind tuberculosis mortality lies a complex and imperfectly understood disease. For it must be conceded that tuberculosis, in spite of the fact that its causative germ is known, and that it has been the subject of endless investigations, is still imperfectly understood. Its manifestations at different age-periods and under different cultural and social conditions, vary as greatly, as if not one but several diseases were concerned.

As a criticism of the tendency to rely too exclusively on mortality statistics for epidemiological investigation, it seems reasonable to point out that, behind tuberculosis death-rates, lie at least three sets of circumstances : those concerned with infection, those favouring or retarding the development of infection into disease, and those leading on to or postponing the fatal termination.

Nor should it be forgotten that each of these three sets of circumstances is dual in nature, depending both upon the infecting germ and upon the infected organism.

It seems clear that epidemiologists should not passively receive and analyse the findings and records of clinicians and pathologists, but should actively associate themselves with the latter and attempt to find, in conjunction with them, new methods of approach to a subject which still defies exact comprehension, and as to which there is so little unanimity in the minds of investigators.

Brownlee's three types of tuberculosis mortality by ages, correspond to part only of the picture of the evolution of pulmonary tuberculosis in man, but they represent the most important part of the problem as it arises in this country.

In order to appreciate their significance, however, it is necessary to go back to the tuberculosis of earlier age-groups in civilized communities and also to consider the tuberculosis of man in the more primitive types of society. It is necessary, too, to have regard to the infected but healthy majority which, in communities with an industrial type of civilization, escapes tuberculosis altogether although its members harbour, or have harboured, living tubercle bacilli.

In order to approach this question of tuberculosis as a whole, in its relation both to disease and resistance to disease, it is an advantage to have in mind some provisional "concept" which will cover not only the known facts of the disease but also the equally well recognized facts as to infection without perceptible disease.

The conception of tuberculosis to which the author has been led through his own observations, is as follows :—

The first stage of tuberculous infection is one in which the lesions are in a "larval" state, localized, as a rule, at or near the portal of entry and in the nearest lymphatic glands, though, as yet, without any obviously harmful effect on the organism. This "larval" stage may lead on rapidly to the generalization of the infection throughout the body, producing the "natural" tuberculosis characteristic of laboratory animals, infants and the adult members of hitherto uninfected communities after heavy infection ; or it may remain latent in the form of "larval" lesions still capable, under disadvantageous conditions, of activation ; or, if held in check, of creating the hypersensitive condition which leads to the inflammatory phenomena associated

with reinfection and characteristic of the "modified" tuberculosis of later life in civilized communities.

Alternatively, such "larval" lesions may serve only as a stimulus to the development of humoral and cellular resistance against the spread of tuberculosis, so that the infective process may end by becoming "compensated" and ceasing to be any further menace to health.

Such a concept, together with the realization that, except in the artificial tuberculosis of experimental animals and in the accidental contamination of wounds and abrasions, tuberculosis infection is not usually a single event but rather a series of repeated re-infections, appears to cover the known facts, and affords a starting point for further inquiries.

In order to simplify this conception and to set it forth in relation to its bearing on the different types of tuberculosis encountered in medical practice, the schematic table given on p. 49 has been prepared.

With this tabular arrangement in mind, it is less difficult to pass on to the discussion of the various stages of tuberculous infection in their order as set forth above.

*The "Larval" Stage of Tuberculosis.*—A great deal of confusion has been brought into our conception of tuberculosis by the attempts of experimental workers to compare the tuberculosis produced in guinea-pigs and rabbits by a single large inoculated dose with the tuberculosis produced in man under the very different conditions of natural exposure to respiratory or alimentary infection in early life.

The subcutaneous, intraperitoneal and intravenous methods of inoculation, while excellent as experimental procedures for the study of certain phenomena of tuberculosis, are totally different from anything that can happen in the natural

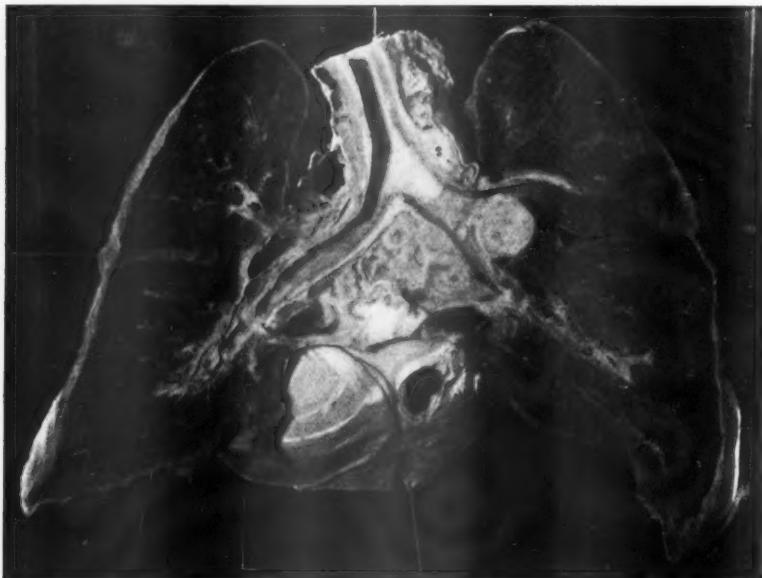
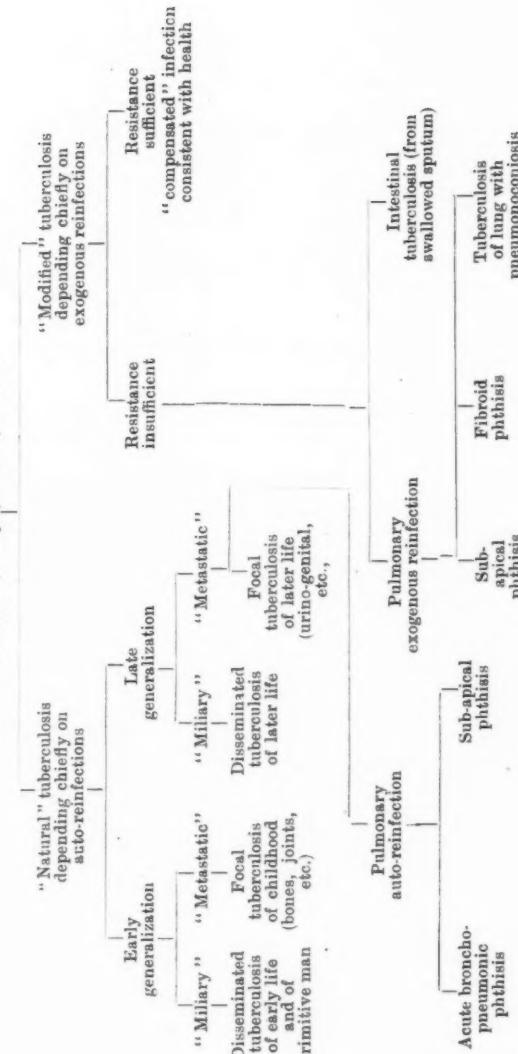


FIG. 1.—"Larval" tuberculosis. Note the enlarged and caseous gland in between the bifurcation of the bronchi at root of right lung. The specimen is from a child of about seven years old killed in a motor accident.

SCHEMATIC EXPLANATION OF THE DEVELOPMENT OF TUBERCULOSIS IN MAN.

*Infection with Tubercle Bacilli.*

"Larval" (chiefly glandular) lesions.



infection of man, and they tend to cut out what is perhaps the most important phase for the student of tuberculosis—the "larval" phase. Under natural, as opposed to "inoculation" conditions, the arena of the first encounter between the tubercle bacilli and the tissues of the human or animal "host" includes the portal of entry, the nearest lymphatic glands, and the tissue-spaces, lymph-channels and collections of lymphoid tissue which lie between. It is in this arena, one of the areas of "primary localization," that the "larval" phase goes through its evolution. In this evolution, the infective foci in the lymphatic glands play the largest part. Where the portal of entry is through the walls of the intestines, the tubercle bacillus appears, as a rule, to pass through to the mesenteric glands without leaving a local lesion behind it. When the bacilli enter through the tonsils or pharynx, there is usually marked involvement of the cervical lymphatic glands, though, except for occasional "concealed" foci in the tonsils, there is but little disturbance at the point of entry. Where the portal of infection is through the lungs, there tends, in most cases, to be a "primary" focus at or close to the point at which the bacilli have gained admittance; but, even here the lung focus tends to be decidedly less important than the corresponding lesions in the tracheo-bronchial glands. These latter tend to escape detection, since they are usually invisible, even by X-rays, being hidden in the dense shadows of the heart, the mediastinum and the vertebral column. They are to be found, if carefully looked for, at post-mortem examinations, when death has occurred from some other cause, and, as a rule, they lead to little or no disturbance of health.

In order to reproduce this phase in experimental animals, it is necessary to bring about an infection without causing any traumatic injury to the tissues at the entry-point. This is best accomplished in guinea-pigs by the instillation of graded emulsions of tubercle bacilli into the conjunctival sac; a method which, provided the infecting dose is kept within suitable limits, is followed by marked cervical adenitis with relatively slight tuberculous disease at the conjunctival and nasal portals of entry: and ultimately by a slow generalization of the infection throughout the animal's organs.

It is possible, by this means, to bring about a fairly accurate reproduction of the phases of "natural" tuberculosis as they occur in man during infancy and early childhood; and the importance of the glandular localization during this "larval" phase is thus brought clearly to light.

*It is to this phase of "primary localization," including the lesions at or close to the point of entry and in the nearest lymphatic glands, that the author has applied the term "larval" tuberculosis; and this name appears applicable to it so long as the lesions remain sufficiently active to be a potential source of autogenous re-infection.*

That it may last on, through childhood and adolescence, into early adult life, and, in certain cases, even into middle age, has been shown by Konyevits in his studies of the cadavers of persons dying from influenza during the epidemic of 1918-1920; but the ultimate tendency, except in those relatively rare cases in which generalization takes place, is towards gradual healing by calcification and fibrosis.

The pathological characters of the pulmonary lesions seen in infancy and childhood during this "larval" stage have been described by Kuss, Ranke, Albrecht and Ghon, Canti and many others.

The persistence of these "primary" lesions as inactive calcareous foci in the lungs of adults, and the marked contrast between their wide pulmonary distribution and the apical or sub-apical localization of the pulmonary lesions of later life, has been beautifully demonstrated by Opie in his combined radiological and pathological investigations on the lungs of adults. While, however, a great deal of stress has been laid on the tendency of these early lesions towards healing and inactivity, their danger as potential sources of autogenous reinfection during adolescence and young adult life has not received sufficient attention. To this point it is hoped

to return in the course of this address, but it is best to discuss it in its proper sequence.

The terms "natural" and "modified" tuberculosis, provisionally defined by the author in his "Hermann Biggs Memorial Lecture" in 1926, require some further consideration, more especially because subsequent investigations have led to a slightly different orientation of his ideas on this subject.

"Natural" Tuberculosis.—The main characteristics of "natural" tuberculosis depend on the fact that the first infection, or the first series of infections, finds the organism in its "virgin" state, unprepared for invasion and incapable of

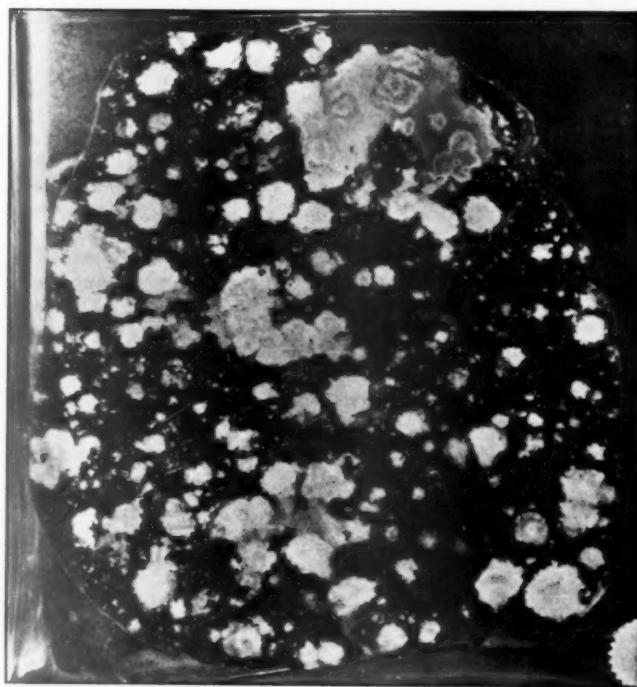


FIG. 2.—"Natural tuberculosis." "Early generalization" (miliary). The specimen represents the spleen of an African native who died from acute generalized tuberculosis. This condition is usually described as "monkey spleen," and is comparable to what is seen in tuberculous monkeys.

immediate reaction. In these circumstances the bacilli excite no inflammatory phenomena in the tissues with which they come in contact and are, therefore, dealt with by the machinery normally available for disposing of inert particles. In other words, they are treated as dust is treated: taken up by phagocytes, carried quietly along lymphatic channels and filtered out in the nearest lymphatic glands. The subsequent events appear to depend chiefly upon the numbers of bacilli involved and the time elapsing before further generalization takes place; but there may also be non-specific factors depending upon the power of the glandular cells and fluids to interfere with the multiplication of the bacilli.

It appears probable that the numbers breathed-in or swallowed by human beings are never of the same order as the numbers commonly used for the experimental inoculation of animals, nor is there any traumatic disturbance of the tissues to facilitate the general spread of the bacilli.

*It may safely be assumed that, under the conditions of natural infection, there must be a stage of relatively unrestricted multiplication of the tubercle bacilli before*

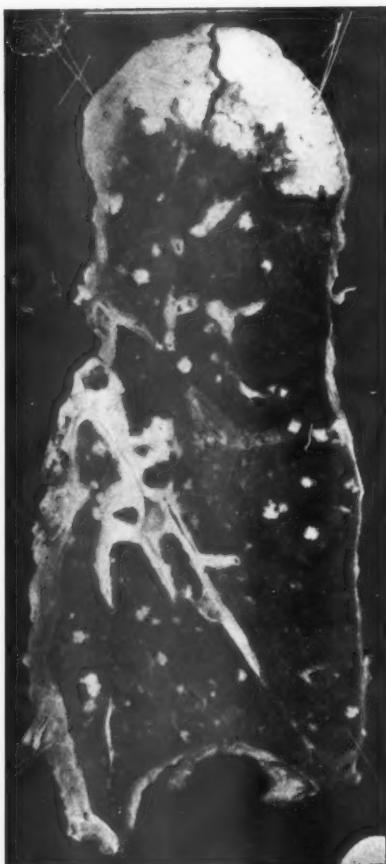


FIG. 3.—"Natural tuberculosis." "Late generalization" (metastatic). Pulmonary auto-reinfection. The specimen illustrates the "young adult" type of acute pulmonary tuberculosis in a young Welsh girl.

*generalization can take place, and everything points to the lymphatic glands close to the normal portals of entry as the site of this multiplication.*

If the multiplication is rapidly accomplished, the stage of generalization which follows finds the organism still relatively unprotected and defenceless, and the entry of large numbers of bacilli into the circulation may result either through the erosion of blood-vessels in the caseo-necrotic zone around progressive lesions, leading

to miliary tuberculosis, or through the passage of infected phagocytes from the caseous glands along lymphatic channels into the thoracic duct and thus, through the general circulation, to such blood-filters as the spleen, the glands, the red marrow, the pia mater, and the other situations in which secondary or metastatic tuberculous foci are prone to develop.

This generalization may take place early or late, and since the results of early generalization tend to be very much more serious than those of later generalization, the two events are here treated under separate headings.

*Early Generalization.*—The acute tuberculosis caused by early generalization is seen in its most typical form in primitive adults when brought from their natural surroundings into sudden contact with infection. No description is necessary, since Borrel, in the report of his studies on the tuberculosis of Senegalese soldiers brought to France for military service in the late war, says the last word on this subject. It is worth recalling, in this connection, that Borrel, a very acute observer, differentiated clearly between an initial "glandular" stage, during which the general health was not much altered, and the subsequent stage of general tuberculosis in which a fatal result rapidly ensued. In other words, even in these rapid cases, there had been a "larval" stage, during which the bacilli underwent their necessary period of multiplication before they could bring about generalized infection of the organism.

This type of tuberculosis may be seen, too, in wild animals, especially monkeys, infected in captivity; and it may occur in European infants exposed to heavy infection in overcrowded houses or, much more rarely, in young children.

But even in primitive man, tuberculous infection alone will usually fail to produce this early generalization unless there are ancillary "factors of aggravation" operative at the same time. It is when these persons are exposed not only to tuberculous infection but also to an abrupt transfer to the unfamiliar conditions of diet, work and accommodation involved in military or industrial service, that they exhibit this fulminating variety of "natural" tuberculosis.

"Early" dissemination, under the disadvantageous conditions mentioned, is usually of the "miliary" type; although the lesions seen at autopsy differ markedly from those associated with the miliary tuberculosis of adults in "civilized" communities, being much more diffuse, much larger and much more caseous.

Where the "early" dissemination takes place in subjects more favourably situated, as in most infants and young children in Europe and America, the risk of "miliary" spread is greatly reduced and "metastatic" dissemination is the rule.

Unless the metastatic foci happen to occur in situations where they are likely to do immediate and intolerable injury—such as the meninges—they may be well tolerated at first or may even become quite latent. They may, however, pass on fairly rapidly into clinically apparent disease, and it is not uncommon to see a number of secondary lesions develop simultaneously in several bones, joints, glands or other organs, in young children.

*Late Generalization.*—Behind the phenomena of late generalization lies the fact that a considerable period of time has elapsed since the first infection established itself in the tissues, and that this interval has afforded to the organism the opportunity of acquiring a specific hypersensitivity to the tubercle bacillus.

In his "Hermann Biggs Lecture," the author used the expression "mixed types" to include cases which, while retaining some of the characters of natural tuberculosis, yet showed evidence of considerable "modification," through the operation of this factor of hypersensitivity.

Later observations, however, have led him to realize that "larval" lesions may still give rise to generalized tuberculosis, even after they have been latent for a considerable time and in organisms that have become markedly allergic. It would seem, in fact, that a very high degree of allergic hypersensitivity is a sign of continued activity of the tuberculous process in larval lesions. Specific hypersensitivity

is just as much a part of "natural" tuberculosis as the specific infection which produces it. If, as was postulated in the lecture, "the main character of 'natural' tuberculosis is a tendency to generalization of infection throughout the body and the main character of 'modified' tuberculosis a tendency to pulmonary localization," then it follows that the "mixed types" are better included in "natural" tuberculosis as the more or less "modified" phenomena of a late generalization.

"Natural" tuberculosis, in short, is the result of the spread of the original lesions, and this spread may take place early or late. "Late" generalization, like early generalization, may be manifest as an acute and sudden invasion of the blood-stream resulting from the bursting of a tuberculous lesion into a blood-vessel or, much more commonly, as the gradual development of a localized tuberculous focus up to the point when it reaches the "clinical level," that is to say, when it causes signs and symptoms. But, in either case, the results tend to be very different from those of early generalization; and the difference lies in this: that late generalization, involving the spread of the infection into hypersensitive tissues, is accompanied by general disturbances, such as pyrexia, and, locally, by inflammatory reactions.

These phenomena of "late generalization" include a long series of stages, varying according to the degree of resistance which has been acquired by the subject and also according to accidental and extraneous circumstances. It must be an accident, for instance, which determines the localization of a lesion in such a position that its spread leads to its opening into a blood-vessel and the consequent sudden dissemination of bacilli throughout all the organs of the body, and that extraneous circumstances may play a part is evident from the frequency with which South African natives, recruited in endemic areas and giving a high percentage of "positives" to tuberculin on arrival, develop generalized tuberculosis within a few weeks after starting work in the gold mines.

So acute and so generalized is the type of tuberculosis in these natives, that there is little to differentiate it from the tuberculosis of "virgin soil" described by Borrel in Senegalese soldiers in France, but—as will be seen when the Report of the South African Tuberculosis Research Committee is published—there are certain features characteristic of the South African type and distinct from the findings of Borrel, notably a greater tendency to pulmonary localization. While it is clear that the degree of resistance acquired by these natives along with their hypersensitivity is not sufficient to suppress heavy auto-reinfection, it is equally clear that they have attained to some power of modifying the course of their disease.

This inability to develop a satisfactory measure of resistance under the stimulus of tuberculous infection appears to be characteristic of the African race, since it is noted not only in South Africa but in the negro population of America also where there has been contact with civilization, and tuberculosis, for eight or nine generations; but there is an approach to the same phenomenon in our own agricultural populations, especially in the more remote districts of Ireland, Wales, Scotland, and the islands around our coasts, and it seems more than probable that some of the "young adult" mortality noted by J. Brownlee in these localities ought to be classified as "natural" tuberculosis and regarded as due to auto-reinfection of the pulmonary tissue as the result of activation of "larval" lesions in adolescence and young adult life. It is seldom that the tuberculosis in such cases is confined to the lungs, although the pulmonary lesions attract clinical attention to the exclusion of less obvious foci, but the latter are usually to be found at post-mortem examination.

Life in a purely agricultural or pastoral community is in many respects the same for the South African natives and for the Irish, Scotch or Welsh country folk of the remoter counties. It is spent in the open-air by day and in small—and sometimes overcrowded—homes by night. If the family includes an open case of tuberculosis, then there is a great risk that the children, heavily contaminated, will die early from generalized disease or, having contracted a severe type of "larval" tuberculosis,

will "break down" at the time of stress that comes with puberty and entry into wage-earning, thus adding to the "young adult" death-rate. But, where the home is free from infection, there is little chance of meeting with it in any dangerous concentration in the fields, and the individual may grow up free from either infection or resistance. Communities of this non-resistant type are liable to very severe tuberculosis when urban extension approaches their district and "tuberculization" first occurs. A most interesting commentary on this question is supplied by Biraud who illustrates his point by citing, amongst other instances, the "centrifugal progress of tuberculosis mortality in Sweden, 1801 to 1920."

But with "tuberculization" on the one hand and a raising of the standards of life on the other, the tendency of the original lesions to spread in the organism becomes less and less marked, and where metastatic spread has actually taken place at a time when the lesions were still in the larval state, the secondary foci so produced may remain latent for years, or perhaps disappear altogether. There is always the chance, however, that small and unsuspected foci in the kidneys or elsewhere may develop into activity late in life.

These forms of tuberculosis, which are frequently unassociated with pulmonary or other manifestations of disease, should evidently be classified as late phenomena in "natural" tuberculosis, and regarded as the coming to fruition of bacillary metastasis from larval lesions rather than as primary tuberculosis of the organ concerned.

"Modified" Tuberculosis. In contrast to "natural" tuberculosis, which results from the spread of the original early lesions and their early or late generalization throughout the body, "modified" tuberculosis includes those manifestations of the disease which result from the exogenous re-infection of hypersensitive tissues, and its characters depend upon the reactions which such re-infections evoke at the point of invasion.

It is obvious that the course of "natural" tuberculosis is more or less modified from the start by the gradual development of hypersensitivity and the power of resistance which goes hand in hand with the progress of the early infection, but the expression "modified tuberculosis" is intended to apply more particularly to the phenomena which occur when new infections gain a footing in tissues rendered hypersensitive by the development of earlier infective processes in the body. In other words, "modified tuberculosis" is the clinical expression of the experimental observation made by Robert Koch in 1901 and known as "Koch's Phenomenon." It is as well to describe this phenomenon in his own words:—

"If we inoculate a healthy guinea-pig with a pure culture of bacilli, the inoculation-point generally closes up and the lesion appears to heal during the first few days. It is only towards the tenth to the fifteenth day that there appears at the point of inoculation a hard nodule which soon opens and leaves a fistula which persists up to the death of the animal.

But guinea-pigs already infected four to six weeks earlier and subjected to a re-inoculation, behave very differently. In them no nodule forms at the point of re-inoculation but, within a day or so after the injection this point becomes indurated and takes on a deep red colour passing on to black over an area of from half to one centimeter in extent. During the next few days necrosis takes place in the skin. This soon sloughs away and leaves a superficial ulcer which soon heals completely without any swelling of the neighbouring glands."

Three features of this experiment stand out prominently in their clinical application; the tendency to necrosis and ulceration, the tendency to healing, and the apparent exemption of the neighbouring lymphatic glands.

"Modified" tuberculosis in man is usually a pulmonary phenomenon because it is through the inspired air that reinfections take place. It is a phenomenon of necrosis followed by cavitation, with resulting ulcerative lesions in the lung-tissue. The tendency to healing—while visible in the inflammatory reactions around the

lesions and the formation of barriers of granulation and fibrous tissue separating the lesions from the surrounding tissues—is greatly hindered by the constant mechanical stresses resulting from the drag of the chest walls in respiration. The almost complete absence of enlargement of the tracheo-bronchial glands, in spite of extensive lung-involvement, affords, perhaps, the most striking contrast to what occurs in the early stages of "natural" tuberculosis, where the lung lesions are minimal and the glandular lesions extensive.

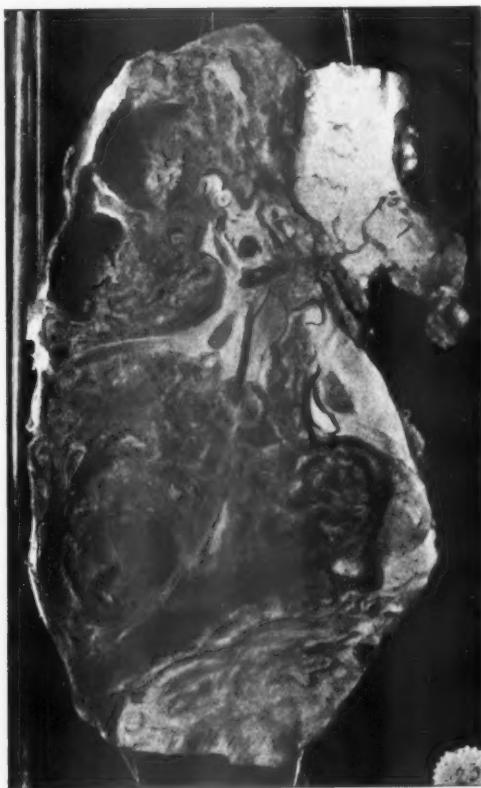


FIG. 4.—"Modified tuberculosis." Pulmonary exogenous re-infection. Illustrating the chronic pulmonary tuberculosis of middle age, accompanied by cavitation.

Chronic pulmonary phthisis is a replica of Koch's phenomenon. So, too, are tuberculous laryngitis and tuberculous ulceration of the intestines, in which the re-infection is caused by tubercle bacilli brought up from lung lesions and arrested on the laryngeal mucous membrane or swallowed into the alimentary tract.

The fact that these laryngeal and intestinal re-infections are by no means invariable as sequelæ of pulmonary tuberculosis shows how efficient is the resistance of the infected organism to re-infection, since the numbers of bacilli passing over

the laryngeal and intestinal surfaces must be enormous, to judge by the numbers visible in the sputum and in the faeces of heavily infected cases.

As to the difficulty of re-infecting already infected tissues, this fact of "acquired" relative immunity resulting from infection has been established over and over again by unexceptionable experiments. It is not necessary to quote in detail the numerous animal experiments carried out by Koch, Trudeau, Calmette, Baldwin, Stanley Griffith, Krause, Soper and a host of others, which place this proposition on a sure footing. The fact has been established beyond any possibility of doubt, and must be accepted by all, that the infected body offers a markedly enhanced resistance to re-infection. As to the mechanism of this resistance, the position is far less clear. There are doubtless an enhanced power of phagocytosis and an increase in bactericidal efficiency, but these factors are difficult to evaluate, owing to the error introduced into *in vitro* tests through the operation of "zones of inhibition" which interfere with opsonic estimations, and to the difficulties inseparable from "bactericidal" tests in connection with such a "slow-growing" and serum-resistant germ as the tubercle bacillus.

We know that a re-infection in tuberculous tissue leads to a different cytological picture from that characteristic of a first infection. There is a much closer approach to an ordinary intense inflammatory reaction—polymorphonuclear phagocytes appearing in large numbers, and this, perhaps, underlies the tendency to tissue necrosis and ulceration, with evacuation of the abscess and a tendency to spontaneous healing.

We possess accurate knowledge on at least one aspect of the problem. Thanks to the experiments of Krause and Willis, we know that "the difference of rapidity of movement of bacilli" along the tissue spaces and lymphatic channels is very great as between "immune and non-immune animals after intracutaneous infection, and over a lymphatic distance of 4 to 5 cm."—twenty-one days in the immunized, as against twenty-four hours in the non-immune guinea-pigs.

This retardation of spread, this effort to localize the trouble, is the outstanding feature of "modified" tuberculosis. It is this feature of "modified" tuberculosis which makes it a disease of surfaces, a disease of those external surfaces, such as the alveolar walls and alimentary mucous membranes, through which re-infections must take place and at which these re-infections are arrested—a contrast to the "natural tuberculosis" which has already penetrated far beyond these surfaces before it excites its characteristic lesions.

All this evidence of the difficulty of re-infection of the infected organism leads on naturally to the question as to how exogenous re-infection of the lungs is at all possible if the resistance to re-infection is so great.

Seeing that, even in cases of well-marked pulmonary tuberculosis with heavily infected sputum, all of which passes up through the larynx and most of which is swallowed, re-infection of the laryngeal and intestinal mucous membranes only takes place in a minority of the cases, how can it be claimed that exogenous re-infection of the lung is possible?

The lung is admittedly more susceptible to infection with tubercle bacilli than the intestine. As Neufeld says, "the doses active by inhalation are distinctly smaller than those effective by feeding."

That this must be so, where any relatively insoluble type of germ is concerned, is evident when we have regard to the fate of inanimate particles after inhalation and swallowing respectively. There is no tendency to accumulation of coal-dust in the intestines of coal-miners, but there is marked accumulation of coal-dust in their lungs. Insoluble particles pass through the intestines like a bismuth meal. But in the lungs the situation is very different. The ciliary mechanism of the bronchial mucous membrane is efficient for the larger particles which fall upon it, but there are no cilia in the alveoli, and it is only by the active intervention of phagocytes that

these air-cells are kept clear of the fine dust particles which enter them. And the clearance is not back into the air passages but inwards, through the alveolar walls, into the pulmonary lymphatic channels and towards the glands at the roots of the lungs. So it is with inhaled tubercle bacilli in the non-allergic lungs of infants, but later in life their arrival in the lungs of hypersensitive subjects is followed by different results. In the latter they excite inflammatory reactions and consequently their passage along lymphatics is arrested or greatly delayed.

The allergic lung retains tubercle bacilli, just as the silicotic lung retains coal dust, the lymphatic channels of exit being blocked, in the one case, by inflammation, in the other, by fibrosis.

The explanation of pulmonary anthracosis is *accumulation* of dust particles. It is suggested that the explanation of "modified" pulmonary tuberculosis is the *accumulation* of tubercle bacilli. Only thus can exogenous re-infection be explained.

It is hard to believe that a dose of bacilli sufficient to bring about a tuberculous lesion in resistant soil can be inhaled on any single occasion, but if once the possibility of *accumulation* be conceded, the difficulty of insufficient dose disappears.

In communities such as our urban populations, in which upwards of 90% give a positive reaction to tuberculin, in which, to judge by recruiting statistics during the Great War, about two in every hundred are actually suffering from tuberculosis without being aware of the fact, and into the midst of which the patients discharged from tuberculosis hospitals and sanatoria are constantly re-introduced, the inhalation of occasional tubercle bacilli must be as difficult to avoid as the occasional inhalation of coal-dust. Where the working day is spent in close proximity to a case of open tuberculosis, the inhalation of germs must be more than occasional, and, where the case exists in the home, the entry of tubercle bacilli into the lungs of the rest of the family must be relatively frequent, according to the size of the living rooms, the amount of ventilation, and so on.

Doubtless the resistance to tuberculosis acquired early in city life suffices to kill off or neutralize such re-infections when the bacilli are few and the intervals considerable, but where the "infective potential" of the air is high, or where there has been simultaneous or previous exposure to the inhalation of particulate matter such as silica dust, capable of favouring the growth of tubercle bacilli in the tissues or of interfering with the lymphatic drainage of the lungs, then it may be expected that the inhaled tubercle bacilli will accumulate and that there will be a risk of "modified" tuberculosis.

Once established, the very factors which defend the body from deeper spread of the infection—the granulation and fibrous tissue barriers produced around the bacillary focus—help to preserve the surviving bacilli from the bactericidal cells and humours, while the lymph-blockage produced by the lesion helps to retain in the immediate neighbourhood such fresh batches of tubercle bacilli as may later be breathed into the lung.

That accumulation of living tubercle bacilli may take place in the lungs is no mere theoretical suggestion. Opie, whose work has gone so far to prove the essential importance of exogenous re-infection in pulmonary tuberculosis, has shown, by his observations on cadavers, that "one-third of pulmonary apices, with no gross or microscopic evidence of past or present tuberculosis, have contained living tubercle bacilli, and the lung tissues from the bases have contained the micro-organism only slightly less frequently."

That minor re-infections occur, to a varying extent but in almost every case, appears clear from the results of "quantitative" tuberculin tests on persons free from clinical tuberculosis, which show great variations in the degree of hypersensitivity, as is seen in the following table:—

## TUBERCULIN TESTS (INTRADERMAL) ON HEALTHY PERSONS.

*Dilutions.*

	1 100,000	1 10,000	1 1,000	1 500	Negative to 1/500	Total
Young males	... 5	... 10	... 18	... 20	... 0	... 20
Old males ...	... 2	... 13	... 18	... 19	... 1	... 20
Young females	... 7	... 10	... 16	... 17	... 3	... 20
Old females	... 2	... 5	... 18	... 18	... 2	... 20
Males	... 2	... 6	... 18	... 18	... 2	... 20
Totals	... 18	... 44	... 88	... 92	... 8	... 100

Here it is to be noted that out of 100 persons free from clinically manifest tuberculosis, 18 were so hypersensitive as to react up to a dilution of 1 in 100,000 of old tuberculin, 44 reacted to 1 in 10,000, 88 to 1 in 1,000 and 93 to 1 in 500. Of the seven negatives, it is probable that some or all would have given a positive reaction if stronger tuberculin had been used. All were adults and half the total number were over thirty-five years of age, so it is most unlikely that their hypersensitivity depended to any great extent upon the continued activity of "larval" lesions. It is much more probable that the variations in sensitivity, at least in the older individuals, were due to varying degrees of accumulated re-infection in the lungs.

The tuberculin tests here recorded were carried out on groups of mentally deficient persons in good bodily health. The thanks of the author are due to Dr. Goodall, the Medical Superintendent of the Cardiff City Mental Hospital, to his successor, Dr. McCowan, and to the other members of the Medical Staff of that Institution, for their kindness in affording opportunities for carrying out these tests. The findings are quite in line with those in other groups of healthy adults tested by the author, so need not be regarded as characteristic only of an asylum population.

The persistence of well-marked tuberculin sensitivity into late adult life is proof positive of re-infection with tubercle bacilli, since the effects of the early lesions must undoubtedly wane and finally disappear, as these lesions gradually become shut off in the process of spontaneous healing.

The picture suggested is one in which every adult member of an urban community is more or less constantly re-infected, but in very varying degree, according to his or her environment, and with very varying results as regards the subsequent development of clinically evident disease.

Such an explanation must underlie the differences between the tuberculosis mortality statistics in agricultural and industrial workers, between males and females, and between different age-groups. On such a conception, too, the effects of malnutrition, poverty, physiological stress, intercurrent disease and such ancillary factors in tuberculosis production are easily understood.

That the conception above formulated is not purely philosophical but is based on observation, the following details may perhaps show :—

The justification for claiming a well-marked differentiation between "natural" and "modified" tuberculosis will be appreciated from the following tabular comparison between the post-mortem findings in South African natives dying at Johannesburg, on the one hand, and Europeans dying at the Victoria Chest Hospital, London, on the other. For the former, I am indebted to the South African Institute of Medical Research; for the latter, to Dr. Roodhouse Gloyne, aided by a grant from the Medical Research Council. A much more complete comparison, based on a larger number of autopsies, will soon appear in the Report of the South African Tuberculosis Research

Committee; those now shown are merely my own analyses of two hundred summaries of post-mortem reports placed at my disposal during a recent investigation.

AUTOPSIES ON BRITISH AND AFRICANS COMPARED. (1.)

*Lungs.*

	Extent	Affected	Caseous	Cavities	Scars	Fibroid
London Cases. 100	+++	92	25	43	2	6
	++	3	17	18	6	6
	+	5	29	12	17	18
	Total	100	71	73	25	30
African Cases. 100	+++	15	6	2	—	—
	++	42	24	1	1	4
	+	28	31	28	10	16
	Total	85	61	31	11	20

AUTOPSIES ON BRITISH AND AFRICANS COMPARED. (2.)

*Abdominal Organs.*

	Extent	Spleen	Liver	Kidneys	Intestine	Peritoneum
London Cases. 100	+++	5	1	3	6	5
	++	4	1	11	13	2
	+	9	3	22	11	6
	Total	18	5	36	30	13
African Cases. 100	+++	18	8	1	1	5
	++	11	13	1	9	7
	+	30	41	27	16	12
	Total	59	57	29	19	24

The greater tendency to lung localization, cavitation and fibrosis in the London cases, and the much more marked generalization of the lesions in the abdominal viscera—the intestines and kidneys excepted—in the Africans, are evident and require little further comment.

The factor of "modification" is, of course, operative in other ways besides its important function of determining localization of re-infections to the lungs and other exposed surfaces. It probably includes all the machinery of spontaneous self-immunization against tuberculosis.

An important element in the process of "modification" is the power of diminishing or neutralizing the toxic processes which lead to death in tuberculosis. The longer an individual, exposed to infection, retains his normal health before showing signs of clinical tuberculosis, the better will his chance be of keeping these toxic phenomena in check.

This is true even of the highly susceptible South African natives, as will be seen from the following table compiled from the clinical and radiological records of native cases at the Miners' Phthisis Bureau at Johannesburg, and studied by the author and Dr. L. Irvine, the Director of the Bureau, during an investigation into the clinical aspects of tuberculosis on the Rand:—

SIMPLE TUBERCULOSIS. DISTRIBUTION OF CASES ACCORDING TO SYSTEMIC DISTURBANCE AND TEMPERATURE. PERCENTAGES.

Years	Sputum—Positives										Sputum—Negatives									
	Normal	S1	S2	S3	Normal	T +	T ++	T + + +	Normal	S1	S2	S3	Normal	T +	T + +	T + + +	T			
First year ... ...	—	20	28	52	21	20	23	36	—	8	22	70	11	17	36	36				
Second and third years	—	23	28	48	32	24	24	20	—	15	30	55	30	13	39	18				
Fourth and fifth years	1	24	38	37	35	32	20	13	—	10	52	38	33	19	24	24				
Over five years ...	4	16	41	39	38	26	27	9	—	32	24	44	56	8	32	4				

Systemic disturbance.—Nil ; slight = S1 ; moderate = S2 ; severe = S3.

Temperature.—Normal ; minimal = T + ; moderate = T + + ; marked = T + + +

It will be noted that the temperature was kept within normal limits in a much larger proportion of cases in those who developed tuberculosis after four or five years of work on the gold mines, as compared with those contracting the disease soon after arrival.

To appreciate the existence of similar factors modifying the course of established infections in this country, it is necessary to apply some form of classification based not only upon the extent of the disease, as in the international classification, but also upon the relation of the individual case to the past history of his or her infection, and upon the degree to which toxic phenomena are or are not under control.

A classification of pulmonary tuberculosis, formulated so as to include these points, was devised by the author in 1922 and was applied to a large number of patients by the Medical Staff of the Welsh National Memorial Association during 1923 and 1924. This classification has been described elsewhere, but its main features are here reproduced for the convenience of the reader :—

" Cases are divided and subdivided as follows :—

" Firstly, on the history and duration of the disease into :—

" (A) *Acute Initial Group*.—A case is to be regarded as 'acute and initial' when the progress of the illness has been continuous from the start, without healthy intervals of any considerable duration. If the disease has continued to progress for more than two years, it ceases to be 'acute and initial' and passes into the 'chronic or recrudescent' for purposes of classification.

" (C) *Chronic or Recrudescent Group*.—A case is regarded as 'chronic or recrudescent' when there have been previous signs of tuberculous infection, such as haemoptysis, pleurisy, bone, joint or gland disease, abdominal or pulmonary infection, but where these have been separated from the present illness by periods of relatively good health. All cases of over two years' duration are to be classified under this heading. It should be noted that acute exacerbations in the course of chronic tuberculosis fall into Group C.

" Secondly, on the anatomical extent of the lesions (international classification) into :—

" (1) *Minimal*.—Disease of slight severity, limited to small areas of one lobe.

" (2) *Moderately Advanced*.—Disease of slight severity, more extensive than (1), but affecting, at most, the volume of one lobe; or severe, extending at most to the volume of one half lobe.

" (3) *Far Advanced*.—All cases extending beyond (2), and all such with considerable cavities.

"Thirdly, on the constitutional balance (Inman's classification) into :—

Stage	Clinical	Pathological
(a)	Resting febrile.	Excessive auto-inoculation occurring spontaneously.
(b)	Ambulant febrile.	Excessive auto-inoculation inducible by exercise.
(c)	Ambulant afebrile.	Appropriate auto-inoculation inducible by exercise."

The periods of survival of the classified cases have been followed up since 1924, and the author desires to express his great indebtedness to his secretary, Miss K. L. Gough, to whom has fallen the laborious work of sorting the tuberculosis death returns from every part of Wales during subsequent years and entering the dates of deaths upon the case record cards. Thanks to these entries, it is becoming possible to obtain a good idea of the survival power in the different groups of classified cases, and it is hoped, in this way, to throw much light upon the facts underlying tuberculosis mortality in the future.

Some of the information already available may serve to illustrate the importance of the "modifying" factors resulting from infection, as regards their influence on the subsequent progress of the disease.

It will be seen, for instance, in the following table, that the C3a cases, although only differing from the A3a cases in the fact that they have given definite evidence of the existence of infection prior to the present illness, are much better able to cope with their tuberculosis than the latter, as shown by a longer "survival period."

COMPARISON OF SURVIVAL PERIODS IN "A3a" AND "C3a" CASES.

Average survival in months	{	A3a				C3a			
		Males	Females	Males	Females	Males	Females	Males	Females
From first visit ...	...	6.4	...	6.6	...	10.1	...	10.0	...
From start of illness ...	...	12.2	...	13.6	...	43.5	...	47.0	...
Total cases	...	197		276		124		95	

The time factor is clearly of great importance. The longer the patient retains his health before "classification" as a tuberculous case, or, in other words, the greater his age when the disease develops, the better, within certain limits, is his chance of a fairly long survival. This enhanced resistance appears to reach a maximum in middle age and, at least in the worst cases, has, perhaps, some tendency to diminish in the later age-groups. The mortality within the first twelve months after the appearance of symptoms is terribly high in cases of this type, while the early deaths are at a minimum, and the late deaths, at four years and over, reach a maximum, in the 35-44 year decennial period.

ADVANCED PYREXIAL CASES (A3a AND C3a) AGE-GROUPS. (PERCENTAGES.)

Survival periods	0-14	15-24	25-34	35-44	45-54	55-
Under 1 year	56	44	31	29	34	38
1-2 years	24	33	34	26	27	26
2-3 "	6	11	15	14	21	15
3-4 "	8	7	7	8	2	6
4 years and over	6	5	13	23	15	15
Totals	37	267	168	121	44	34

In the remainder of the classified cases in which the deaths have been notified to date, the same tendency to a better resistance in later life is to be observed, but not the fall in resistance in old age. The exclusion of the A3a and C3a cases leaves a group with a consistently better expectation of life, but the "survival" of those contracting the disease early remains brief.

ALL CLASSIFIED CASES EXCEPT A3a AND C3a. AGE-GROUPS (PERCENTAGES).

Survival periods	0-14	15-24	25-34	35-44	45-54	55+
Under 1 year	30	28	20	17	12	15
1-2 years	41	31	21	26	35	28
2-3 years	15	18	22	15	13	15
3-4 years	8	11	11	17	13	20
4 years and over	6	12	26	25	27	27
Totals	53	410	274	161	99	35

Whether the views provisionally expressed in this paper are the correct ones or not, it is hoped that they may serve, at least, to show that there is still a vast field for epidemiological investigation in the direction of the systematic examination of clinical and pathological data. Whatever be the nature of the factors determining "modification" of type in tuberculous disease, they are almost certainly the same that enable a majority, in our industrial populations, to escape the disease in spite of constant exposure to infection, and as such they deserve the closest study.

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*Discussion.*—Dr. F. PARKES WEBER said that in regard to the question of miliary tuberculosis of the lungs resulting from a primary tuberculous focus in the testis of animals (experimental), he could recall an analogous case in a man, aged 33 years, who died in hospital under his care in 1897, with acute miliary pulmonary tuberculosis, confirmed by post-mortem examination. The lungs were "stuffed" with tubercles. The left epididymis, where the patient had received a blow twenty-five days before his death (this injury had been followed by local and general symptoms), was found to contain a softened, caseous nodule. He (Dr. Weber) had published the case as a good example of fatal tuberculous dissemination (mostly in the lungs) following an injury to a portion of the body containing a caseous focus.<sup>1</sup>

Dr. J. D. ROLLESTON, referring to the influence of certain acute infections and intoxications on the course of tuberculosis, said he used to be taught that measles predisposed to tuberculosis or roused into activity a dormant tuberculous process. Recently, however, there had been a tendency, especially among German observers, to exculpate measles in this respect. The same remark applied to influenza. Opinions also differed as to the influence of alcohol on tuberculosis. A recent paper by Bandel, of Nuremberg,<sup>2</sup> showed that while during the War there was an increase in the mortality from tuberculosis, chiefly due to scarcity of food, in men between the ages of 40 and 70, the harmful influence of this scarcity of food was so much counterbalanced by the benefit derived from the scarcity of alcohol that the mortality from tuberculosis in men of this age was greatly reduced.

<sup>1</sup> F. P. Weber, "Traumatic Pneumonia and Traumatic Tuberculosis," London, 1916, pp. 26-28.

<sup>2</sup> Bandel, R., *Zeitschr. f. Tuberkulose*, 1929, iv, 238-45.

Professor CUMMINS (in reply) stated that his own experience of cases with miliary tuberculosis tallied with that of Dr. Parkes Weber. As to the effect upon tuberculosis of intercurrent disease, he was not in possession of any new statistical data, but he referred Dr. Rolleston to the Registrar-General's 82nd Report (1919) in which was given a diagram of tuberculosis mortality in females from 1911 to 1912. The tuberculosis mortality for the last quarter of 1918, a period in which the influenza epidemic was at its height, rose to an extremely high figure, suggesting that influenzal attacks led to an enhanced mortality amongst those suffering from pulmonary tuberculosis. It was worth noting that no such rise of mortality occurred amongst those suffering from surgical tuberculosis, so that the effects of the influenzal attacks must have taken the form of local disturbance of lung and gland lesions.

## Section for the Study of Disease in Children.

[April 10, 1930.]

### Enlargement of Several Joints (? causation).—DAVID NABARRO, M.D.

H. B., a boy, aged 8 years and 4 months.

*History.*—The child is the eldest of a second marriage, and the mother is said to have become infected with syphilis by her first husband previous to 1916.

There were no infantile symptoms of syphilis and the child was apparently well until the age of 11 months, when he had an acute attack of "dysentery," with blood and mucus in the stools. He did not make a good convalescence, and the mother states that the joints became swollen immediately afterwards, first the knees and then the ankles and wrists. Apparently the joints were thought to be syphilitic, because a blood-test was taken of both mother and child, and although the child gave a negative Wassermann reaction that of the mother was positive.

In October, 1927, the doctor who attended him said that the child had painless hydrops of knees, ankles and wrists. He had eighteen injections of sulphostab and gray powder. The joints showed a little improvement at first, but subsequently relapsed under the treatment. He was sent up to the Hospital for Children, Great Ormond Street, in June, 1928, in much the same condition; that is to say the knees, ankles and wrists were still swollen. Skiagrams of the joints taken in June and October, 1928, showed no bone or joint changes. When admitted recently, for the third time, the knees and elbows were considerably enlarged, and about 12 c.c. of clear fluid was aspirated from each knee-joint. No organisms of any kind could be obtained from the knee. There is no other evidence of syphilis, except perhaps a slight tapering of the central incisor teeth.

There have been seven Wassermann reactions taken during the course of two years, which have all been negative in spite of a provocative injection of novarsenobillon. The blood has also been tested for agglutination of dysentery bacilli with somewhat doubtful results.

A negative Wassermann reaction does not absolutely contra-indicate syphilis, especially if, as in this case, the family is known to be syphilitic, because of the positive Wassermann reaction in the mother. I have not yet given anti-syphilitic treatment to this boy, because I did not think the joints were syphilitic, but one ought to do something, and not allow him to become progressively worse. I took about 12 c.c. of fluid from each joint a week or two ago, but was not able to grow anything from it. It was almost clear, gelatinous-looking fluid. Since the patient has been in hospital the fluid has not re-accumulated. In my experience, painless enlargement of joints due to syphilis, readily responds to anti-syphilitic treatment. Skiagrams shown indicate that there are no bony changes in these joints. I have tried various skin tests, with dysentery cultures and fluid from the knee-joint, but, though we have had positive reactions, they have not been helpful, as "controls" were also positive.

Dr. REGINALD MILLER said he regarded this as a case of an abnormal type of congenital syphilitic disease—not ordinary infective arthritis. He would not expect such a course in an arthritis of dysenteric nature. The three points which favoured the diagnosis of syphilis were: (1) when at 12 months of age the arthritis was seen, it had evidently been sufficiently characteristic to lead to the testing of the mother's serum, which was then positive; (2) the swelling of the knees was of the typical syphilitic variety; (3) the character of one tooth.

### Syphilitic Cirrhosis of the Liver in a Boy.—DAVID NABARRO, M.D.

A. B., a boy, aged 11 years and 9 months.

*History.*—Patient is the seventh child. The eldest, a girl, born in 1901, is mentally defective. In 1928 her Wassermann reaction was negative, and her Kahn reaction positive. The next five children were all born prematurely, and died at ages from

6 hours to 1 month. Patient was born in August, 1918, suffered from marasmus at the age of 5 weeks, and had snuffles, and a rash on the feet. He attended hospital for one year and was presumably given the usual mercury treatment. There was no epiphysitis and the Wassermann reaction was not tested. When 2½ years old he attended hospital for rickets and at that time the tonsils were removed. In May, 1926, he complained of "pain in the right side," for which he attended another hospital intermittently for one year. In May, 1927, he came to the hospital in Great Ormond Street, under Dr. Cockayne, complaining of pain in the right side of the abdomen, on deep breathing. The liver was enlarged, nodular, and very hard. The spleen also was hard and enlarged. A diagnosis of syphilitic cirrhosis of the liver was made and a blood-test gave a very strongly positive Wassermann reaction. He was admitted into the ward and at the time was described as having the facies of cirrhosis of the liver, with large eyes, and there were telangiectases on the cheeks and right fore-arm. On examination, there was an obvious tumour in the epigastrium and the liver could be felt three finger-breadths below the sternum. The spleen was palpable one finger-breadth below the costal margin. The spinal fluid was examined and found to be normal; the urea concentration test was good and the lœvulose blood-sugar test gave figures within the normal limits.

After a few months' treatment with perchloride of mercury and potassium iodide the liver seemed to become smaller and less firm and the spleen diminished in size. Injections of sulphostab were started in September, 1927, and continued until October, 1928, forty in all, totalling 6·25 grm. Later he had nineteen injections of bistovol, and as the Wassermann reaction was still strongly positive in February, 1930, he was inoculated with malaria. The first two attacks upset him so much that the infection was cut short with euquinine, and daily injections of T.A.B. vaccine were given.

As a result of the T.A.B. injections he has had ten rises of temperature. Since then he has improved, and now he is having bismuth oxychloride injections, because after the protein shock with T.A.B. or malaria one should begin anti-syphilitic treatment again. It is safe to give injections of arsenic, even though there may be marked affection of the viscera, but care must be exercised.

#### **Mental Defect in a Congenitally Syphilitic Child.—DAVID NABARRO, M.D.**

C. S., a boy, aged 10½ years. *History.*—The patient is the firstborn; four subsequent children have either died young, or were stillborn. He was a small child at birth. At the age of 6 weeks he was taken to a hospital for chest trouble, and was an in-patient for two months. Here he contracted diphtheria, and was for fifteen months in a fever hospital. There is no history of rash, epiphysitis, or fits.

In March, 1930, he was sent to the Hospital for Sick Children, Great Ormond Street, by the school doctor, as being a low-grade mental defective, with a mental age of about 6, said to be very irritable, bad-tempered and spiteful at times. His vision is good; the teeth are typically Hutchinsonian, the molars being of the Moon type. The blood Wassermann reaction is very strongly positive, and so is the Kahn; the Vernes is 119. The cerebrospinal fluid is normal in all respects.

The mother's Wassermann, Kahn, and Vernes reaction, are all strongly positive.

*Treatment.*—Injections of bismuth oxy-chloride are being given.

In some respects this child is precocious. In children who are backward mentally the cerebrospinal fluid often gives a positive Wassermann reaction, but in this case the reaction is negative. Further, the fluid may give a positive Wassermann reaction when there are no mental signs at all.

*Discussion.*—Dr. A. G. MAITLAND-JONES asked how many mentally defective children gave a positive Wassermann reaction either in the blood or in the cerebrospinal fluid. In other words, was congenital syphilis responsible for much mental defect? Also had it been proved that a mother who was syphilitic could transmit the disease to her child, and did congenital syphilis extend to the next generation?

Dr. W. G. WYLLIE asked to what year of life Dr. Nabarro continued anti-syphilitic treatment of children serologically resistant to the different forms of treatment. In some children the Wassermann reaction was but little affected, and he would like to know whether Dr. Nabarro treated such patients until they were beyond the age of puberty.

Dr. E. STOLKIND said that there were cases of old and latent syphilis, more especially of visceral syphilis, in which the Wassermann reaction remained positive after persistent treatment with mercury, bismuth, salvarsan and malaria. This was especially true of congenital syphilis. There were cases in which the Wassermann reaction became negative for a short time after treatment and then became positive again and remained so. As it so frequently had no effect in changing the Wassermann reaction from positive to negative, he thought that children with congenital syphilis who were otherwise healthy, should not be given malaria or typhoid-paratyphoid treatment which might be attended by complications. He had neither seen nor read of a fully proved case of congenital syphilis of the third generation, though this had often been claimed.

Hutchinsonian teeth were not an absolute proof of congenital syphilis, as they had been found in children with rickets as well as in children infected during the first few months of life. He (Dr. Stolkind) had had a case of a baby who developed a hard chancre on the lip after infection by a man, and later infected its mother who developed chancre on the nipple.

Syphilis could not be considered the only cause of the mental deficiency. In fact he had had in his care many mentally deficient children in whom and in whose parents no signs of syphilis were to be found.

Dr. F. PARKES WEBER asked whether therapeutic inoculation with malaria had been frequently tried in England by Dr. Nabarro and others in syphilitic cases, apart from general paralysis of the insane and tabes dorsalis. Also whether T.A.B. inoculations were generally regarded as in any way equal in efficiency to therapeutic malaria. He regarded it as a very responsible matter to recommend T.A.B. inoculation instead of malarial inoculation. He understood of course that in this particular case Dr. Nabarro had been obliged to cut short the treatment by therapeutic malaria.

Dr. NABARRO (in reply) said there were various opinions as to how far syphilis was responsible for mental defect. One might get a positive Wassermann reaction in a number of mentally defective children, but one could not be sure that syphilis was the sole cause of the mental backwardness. The child might come from a bad stock generally, as well as from a syphilitic one, and the two together might cause the defective mentality, or the syphilis might have nothing to do with it. His own experience was that a small proportion sent from outpatient departments as backward children gave a positive Wassermann reaction, but, on the whole, syphilis was not a very common, or a necessary, cause of mental defect in children.

The point as to transmission of syphilis to the third generation was a moot one. Sir Jonathan Hutchinson referred to such cases, and Fournier, in France, gave a large number. In his (the speaker's) series of 600 families having syphilis, he had come across twenty-two families in which syphilis extended to the third generation, but one could not say whether the syphilis in the third generation had been produced by the father of that child, or whether it had come down to the child from the grandparents. It was difficult to be dogmatic in the matter. One received little help from testing the blood of the father. He had found that 70% of the fathers of syphilitic families were Wassermann-negative. In several families he had found that a child's mother and grandmother both gave a positive Wassermann reaction.

In answer to Dr. Wyllie, he did not treat these children beyond their twelfth year at the hospital, but sometimes he carried on the treatment afterwards, privately. When he began treating them he stopped at forty injections of arsenic, as he thought that was enough for any child, but a certain number remained Wassermann fast: then he went on to bismuth and continued with proto-iodide of mercury pills. Recently, however, he had been trying other methods, particularly protein shock treatment by malaria or T.A.B. injection. He had now treated about twenty children with malaria—half with direct mosquito infection, half with blood—and the best result was in the case of a girl who had juvenile general paralysis of the insane. She was acutely maniacal when she came to hospital, and he had treated her with malaria and inter-cisternal injections of salvarsanized serum. She was now a physically fine girl, aged 10, though, as she had sustained a rude shock to her brain, she was still backward; blood and cerebrospinal fluid Wassermann had been negative for the past three years. A number of children, some with neuro-syphilis, gave a positive Wassermann

reaction in the cerebrospinal fluid. He did not think T.A.B. vaccine was as good as malaria. A year ago Dr. J. M. Mackenzie had read a paper at the Medical Society for the Study of Venereal Diseases—in which he stated that he had had good results from T.A.B. vaccine and did not find it so severe as the induction of malaria. If one had an old patient, whose heart was not very sound, it might be wiser to use T.A.B. than to give tertian malaria, if quartan malaria—which produced less severe results than tertian—could not be procured.

In answer to Dr. Stokind, this child's blood and cerebrospinal fluid gave a negative Wassermann reaction after the arsenic. He was convinced that syphilis passed to the third generation. He had one case of a congenitally syphilitic father who had transmitted syphilis to his children without, apparently, infecting the mother, and whose Wassermann reaction was persistently negative, even after a provocative injection of novarsenobillon. He did not believe that Hutchinsonian teeth occurred in any disease other than syphilis. In rickety teeth the cutting edge of the tooth was pitted and thin, and the enamel was thinned. He had never seen a child with a lesion of acquired primary syphilis.

#### **Gastromegaly from Congenital Duodenal Ileus showing Spontaneous Improvement.**—REGINALD MILLER, M.D.

M. M., girl, aged 6 years and 10 months, born June, 1923. Birth weight 4 lb. From birth there was great difficulty in getting food taken, and later there was strenuous refusal of food. Vomiting occurred occasionally. It was copious, projected and nocturnal, and contained food taken many hours previously. It was accompanied by diarrhoea, with mucus and sometimes blood, in the stools. Progress for the first four years was slow, chiefly owing to the refusal of food.

November, 1928.—X-ray examination showed a very large stomach hiding the pylorus and duodenal cap. The child was ordered a dry diet.

March, 1929.—Improvement had occurred, the vomiting having ceased. A second X-ray examination showed less enlargement of the stomach, the duodenal cap could be seen and appeared normal. There was a suggestion of hyper-peristalsis, and the emptying time was normal.

September, 1929.—At this time visible gastric peristalsis was observed when the stomach was inflated with soda water. Improving.

March, 1930.—Weight 42½ lb., height 45 in. No vomiting has occurred: the appetite is better, but the child is never hungry. Visible peristalsis as before.

I ask your consent to a syndrome in which there is from birth a mild obstruction to the evacuation of the stomach. If we set aside the question of the aetiology, the disorder has three characteristic points: (1) The history from birth, which, properly interpreted, leads to the diagnosis of obstruction to the evacuation of the stomach. But as it is so mild, the ordinary spectacular symptoms of obstruction are absent. There is a refusal of food, the bad appetite being a result of gastric stasis and chronic gastritis. It is because so little is eaten that vomiting is kept in abeyance, and vomiting does not begin until the second year of life, when the child is put on to a diet consisting of fluids and solids in fair quantity, and is old enough to be pressed to take food against its inclination. The vomiting is then characteristic of obstruction; it is projectile, and the food vomited is that which was taken some time before, it may be even the previous day's food. With the attacks of vomiting there is diarrhoea with mucus in the stools. The mucus passed is sodden and thick, it comes mainly from the stomach, not from the intestine. In the present case, for the first four years of her life the patient had to have a trained nurse, and it is clear there had always been a difficulty about the taking of food. (2) The signs are characteristic; there is visible gastric peristalsis, seen when the stomach is distended with food or gas. On X-ray examination the stomach is seen to be greatly enlarged: the obstruction is beyond the stomach, the pyloric part being normal. (3) After 5 or 6 years of age these patients undergo spontaneous improvement. In some of my cases, after a year or two of treatment, the symptoms ceased altogether. The moment this present child was put on a dry diet by her doctor the vomiting stopped:

she came to us at the critical moment, and probably the treatment shortened her symptoms by a year or two.

With regard to the cause: there are not many causes to think of if the stomach itself is excluded. If the site of the obstruction is in the duodenum it cannot be seen by X-rays, as it is too slight, at least while the child is not having a vomiting attack. It cannot be due to atresia or stenosis, because of the spontaneous improvement which occurs, and it is not due to a band, because that would cause painful dyspepsia. These children have no pain, except just before the vomiting. There may be a duodenal ileus, or pressure on the duodeno-jejunal flexure by the root of



Skiagram of enlarged stomach five minutes after ingestion of opaque meal; erect.  
(Dr. Reginald Miller's case.) Taken after five months of dietetic treatment.

mesentery and the superior mesenteric artery. In support of this view, I may say that the first case I had operated on was a clear instance of duodenal ileus. Professor Wilkie, who has described chronic duodenal ileus in adults, has noted that many of his adult patients had shown symptoms of vomiting during childhood; these then ceased for a number of years, and recurred later in life when the patient began to have gastroparesis. I believe, therefore, that these are the same cases but diagnosed during childhood, the congenital compression being sufficient to give rise to a mild obstruction from birth.

*Discussion.*—Dr. R. C. JEWESBURY said that duodenal obstruction in infants must be very rare. He had seen four cases, two of which were due to atresia. Of the others, one was due to pressure of an aberrant artery, the other to pressure from an abnormal peritoneal fold. At first they were thought to be cases of pyloric obstruction, but in all four, though there was visible peristalsis and the vomiting was projectile, the vomit was bile-stained, and it was on that fact that the diagnosis of duodenal and not pyloric obstruction was made. He did not know whether this child's vomits were bile-stained. He would like to know how this condition was to be diagnosed in infancy, and how it was to be distinguished from ordinary pyloric obstruction. Unless there was bile-stained vomit, the case looked like pyloric obstruction, and might be treated as such. Was it possible that some of the cases were due to some unusually persistent type of pyloric obstruction? Were they mild, incomplete cases of pyloric obstruction which, if left untreated, persisted?

Dr. PARKES WEBER asked whether any attempt had been made to pass a duodenal tube for diagnostic purposes.

Dr. STOLKIND asked how one was to prove that the mucus found in the faeces was from the stomach and not from the intestines. Had Dr. Miller washed out the stomach and if so, had he found much mucus? Also, had he washed out the intestines and failed to find mucus?

Dr. MILLER in reply to Dr. Stolkind said that when washing out the stomach, one could get an abundant supply of mucus, and it was not difficult to differentiate between the mucus in the stools which came from high up and that which came from the colon. That from the stomach or its vicinity was in large thick masses, and was sodden and white or bile-stained. The only proof he had of that fact was that some months after a short-circuiting operation in his first case, the mucus had disappeared from the stomach and from the stools at the same time, and the tongue had cleared.

In answer to Dr. Parkes Weber, he had used the duodenal tube in only one case, when he tried to inject barium cream through the pylorus into the duodenum. Though that had shown, in the skiagram, the duodenal cap, it did not show the distal parts of the duodenum.

In reply to Dr. Jewesbury, the whole difficulty in diagnosing these cases was not to differentiate them from cases of pyloric obstruction, but to recognize in them any obstruction at all. He had seen about fourteen cases which he was satisfied were of this nature, and in not one had obstruction been suspected previously. Much time needed to be spent in looking for peristalsis. In the cases to which Dr. Jewesbury referred there had been a much greater degree of obstruction. The cases he (the speaker) had been describing were conveniently termed "gastromegaly," as the enlarged and hypertrophied stomach was the most striking clinical feature, the obstruction was mild, and the difficulty was in recognizing the presence of any obstructive factor.

#### **Neurofibromatosis.—W. G. WYLLIE, M.D.**

A. H., a boy, aged 14 years. A small, soft lump was noticed at birth in the right lumbar region. This gradually grew larger, and was removed by Mr. Tyrrell Gray when the boy was 6 years old. A large, soft fibroma was removed from the left buttock when he was 9 years old, as it was giving rise to pain.

The interest of the case lies in the number of superficial nerves which are thickened and easily palpable throughout a considerable extent of their course. Among these, on both sides of the neck, are the great auricular, nervus cutaneus colli, and a branch of the supraclavicular nerve (all emerging from the posterior border of the sternomastoid at its middle). Other nerves easily palpable are supra-scapular branches, both ulnars, and the external cutaneous in the leg. Several small cutaneous fibromata are present in the skin.

No other member of the family is affected.

*Discussion.*—Dr. F. PARKES WEBER said that the first two great monographs<sup>1</sup> in the English language regarding Recklinghausen's neurofibromatosis drew attention to a special point that Dr. Wyllie spoke of in his case, namely, the beaded or continuous enlargement of

<sup>1</sup> R. W. Smith, "Treatise on Neuroma," Dublin, 1849, and Alexis Thomson's monograph (1900), in both of which there are illustrations showing thickening of nerve-trunks in the limbs of patients, obvious by mere inspection during life. Smith's work was before Recklinghausen's excellent account, which was published in 1882.

superficial nerves, which in some cases could even be seen by ordinary inspection as well as felt. He (the speaker) alluded to that in an article with Dr. Perdrau in the current number of the *Quarterly Journal of Medicine*.<sup>1</sup> He would like to know at what age the various symptoms were first noticed in the present case.

**"Idiopathic" Hepatic Cirrhosis with Recurrent Jaundice.—F. PARKES WEBER, M.D., and M. SCHOLTZ, M.D.**

The patient, D. P., aged 12 years, is a somewhat fat girl with considerable enlargement of the liver (which now reaches down to the umbilical level and is bulging) and a few telangiectases on the face, but at present without any other obvious abnormal signs. On February 6, 1930, she was admitted to hospital with slight jaundice of obstructive type, with a positive direct Hijmans van den Bergh's reaction for bilirubin in the blood-serum, and with a history of having had recurrent or remittent jaundice and frequent epistaxis during the preceding fourteen months. She had never had haematemesis. There was no definite enlargement of the spleen and certainly none of the superficial lymphatic glands. The blood-serum gave negative Wassermann and Meinicke reactions. The urine contained some excess of urobilin and urobilinogen, but no bilirubin; probably the attack of jaundice was already disappearing. The galactose test showed an impairment of hepatic function. The resistance of the erythrocytes towards graduated hypotonic sodium chloride solutions was within normal limits. The cutaneous reaction to echinococcus antigen is negative. Nothing special in the family history. Under dietetic and saline treatment the jaundice gradually disappeared. The case appears to be one of hepatic cirrhosis of uncertain origin in a child (cf. F. Parkes Weber, "The Nature of Banti's Disease and its Relation to Idiopathic Non-alcoholic Progressive Hepatic Cirrhosis in Children," *Brit. Journ. Child. Dis.*, 1923, xx, 78).

**Old Pericardial Rheumatic Nodule (Specimen).—F. PARKES WEBER, M.D., and M. SCHOLTZ, M.D.**

The specimen is from a girl (I. G.), aged 14 years, with old rheumatic heart disease, who had long been a "cardiac cripple" before she died. At the post-mortem examination the heart was much enlarged, with completely adherent pericardium, old disease of the mitral valve and to a lesser extent of the tricuspid valve. A whitish fibrous-looking nodule of about the size of a small pea was removed from the pericardial tissue over the right ventricle in front of the heart. The microscopic section of this nodule, which was immediately adjacent to the myocardium, shows that it is composed of fibrous tissue very rich in minute blood-vessels, but containing very little blood. Around one or two of the vessels are small collections of lymphocytes. In the centre of the section is a little artery. We regard this as an old organized pericardial rheumatic nodule, but no subcutaneous nodules had been noted during life. No bacteriological examination was made.

Dr. REGINALD MILLER said he did not think that pericardial rheumatic nodules were very rare. They were seldom looked for, and therefore rarely found. However he did not think that the question of subcutaneous nodules was of importance in this connection.

**Pathological Sleeping.—D. W. WINNICOTT, M.R.C.P.**

Patient, a girl, aged 9 years, was brought to the Queen's Hospital for Children on account of falling asleep in the daytime. This had been a symptom since soon after tonsillectomy at the age of 7 years (February, 1928). At the same time she became very nervous at night-time and began to have nocturnal enuresis. No micturition disturbance by day.

The family is healthy. There are seven other children.

*Course.*—Soon after the onset of the tendency to go to sleep by day she was admitted to the Hospital for Sick Children, Great Ormond Street, where she was apparently normal.

<sup>1</sup> Weber and Perdrau, "Periosteal Neurofibromatosis, &c.," *Quart. Journ. Med.*, 1930, xiii, 151.

About three months after the onset, she woke in the night and cried excessively for an hour. At that time, if she woke at night, she had to get into her parents' bed ; she constantly imagined someone was in the room.

In February, 1929, she went to a convalescent home where she was quite normal except for enuresis, for which she was sent home after three weeks. The sleeping then returned, though with a tendency to diminution. At that time she had constantly red eyes due to rubbing. Along with the symptoms there has been observed no alteration in character.

In November, 1929, the condition was as bad as ever ; that is, although otherwise normal, she would go to sleep, "even over dinner." She went to bed regularly at 6 p.m., falling asleep immediately. Enuresis continued. When awake she was lively, ate well, enjoyed playing games with her friends. She had a repeated face movement, a protrusion of the under lip by the tongue, "to keep herself awake," as she put it.

She is now nearly normal at home, but at school she still sleeps, "even in singing lessons." At night she lies awake, and also becomes manifestly anxious, waking in night terrors, knocking on the wall till her mother goes in. Otherwise she is intelligent, romps, plays, eats normally, is reliable, and does well at school. When she is asleep, however, "you cannot wake her, she is off in a dead sleep."

At no time has any sign of central nervous disease been detected. Discs normal.

Clinically, the case falls between two groups. On the one hand are those rare cases which, because of day-sleepiness and lack of desire to rest at night, and with other details of altered behaviour and character, lead one to postulate an encephalitis lethargica that was not diagnosed at the time. On the other hand are the much commoner cases in which increased tendency to sleep is due to psychological causes, without physical basis. The important factor here is the lessening in value of night-sleep owing to anxiety, with night terrors, sweating and restlessness. In severe cases the sleep in the day is also caused by anxiety present in the day also, and sleep may, in these cases, be found to have become invested with intensely pleasurable feeling belonging to the phantasies that, because they are felt to be forbidden, are giving rise to the anxiety.

*Discussion.*—Dr. T. M. LING suggested that this was a typical case of narcolepsy, having regard to the profundity of the sleep and the difficulty of awaking.

Dr. WINNICOTT (in reply) said that apart from the sleeping, the child was normal. He realized that narcolepsy was a possible label, but as none of the published cases of narcolepsy had been properly studied from the psychological point of view, he was not yet convinced of the value of the term, implying as it did, physical disease of the brain.

**Cleido-cranial Dysostosis.**—H. E. MANSELL, B.M., B.Ch. (for Dr. DONALD PATERSON).

C. W., a girl, aged 11 years and 7 months.

Brought to hospital in January, 1930, complaining of a limp, of one year's duration.

*Past History.*—Measles, whooping-cough, chicken-pox.

*Family History.*—One other child, female, 18 years old, healthy ; mother healthy, facies normal ; father said to resemble patient.

*Condition on Examination.*—Intelligent child ; moderate height. Large head, circumference 22 in. Forehead prominent, depressed in centre ; "hot-cross bun" head. Bridge of nose depressed.

Clavicles small, deficient in middle one-third ; shoulders can be approximated anteriorly.

Deformity of terminal phalanx of both thumbs ; coxa vara, left hip.

*X-ray Appearances.*—(1) Congenital defect of both clavicles. (2) Occiput formed of Wormian bones. (3) Small pituitary fossa. (4) No frontal sinuses. (5) Extra epiphysis for second metacarpal on each side. (6) Spina bifida, first lumbar

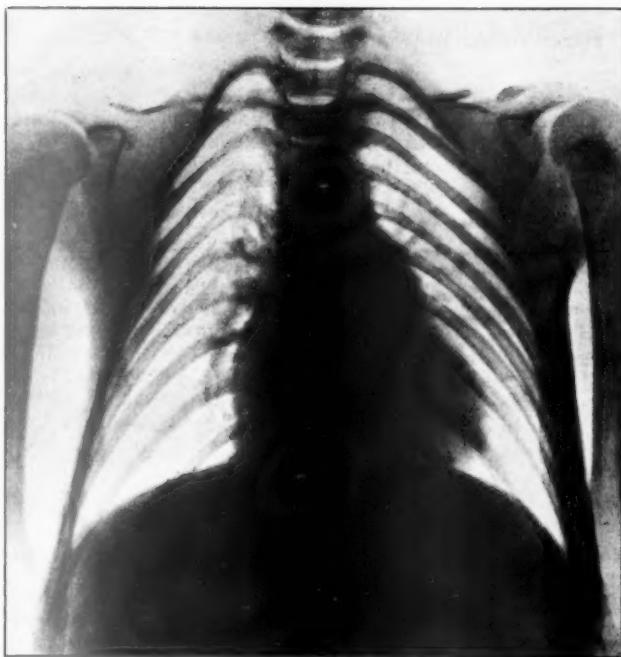


FIG. 1.—Skiagram showing defect of both clavicles. (Dr. H. E. Mansell's case.)



FIG. 2.—Skiagram showing occiput formed of Wormian bones. (Dr. H. E. Mansell's case.)

vertebra. (7) Coxa vara, left hip. (8) Lesion of epiphysis of both first metatarsals. (9) Deformity of terminal phalanges of both thumbs, and both great toes. (10) No evidence of pulmonary osteo-arthropathy (figs. 1 and 2).

*Blood.*—Wassermann reaction negative. Inorganic phosphates, 6 mgm. per 100 c.c. plasma. Calcium 10 mgm. per 100 c.c. plasma.

I can find no trace, as far back as the grandparents on both sides, of any similar abnormalities. The case resembles one shown last year by Mr. Eric Crook, in which there was a similar deficiency of the middle of the clavicle instead of the more common absence of the acromial end. The aetiology seems to be obscure. Dr. Poynton mentioned a case in which the mother, during her pregnancy, was interested in pigeons, admiring the slimness of their shoulders, and she attributed the deformity of her child to that. The present child was *in utero* during the air raids, and the father blames them for the deformities. Cases of associated coxa vara have been described by Barrington-Ward. I should be glad to hear whether Members think this dysostosis is due to chemical deficiency or to some variation or mutation.

*Discussion.*—Dr. PARKES WEBER said he supposed that cleidocranial dysostosis must belong to the large class of congenital developmental abnormalities which were presumably due to variation or mutation. Whether there were a family history or not, he thought that no other explanation was satisfactory.

Dr. REGINALD MILLER asked whether it was not unusual to have the bones other than the membrane bones affected in this condition.

Dr. H. E. MANSELL (in reply) said the condition was usually described as a maldevelopment of membrane bones, affecting those of the skull and the membranous portion of the clavicle. It might or might not be associated with other abnormalities, such as coxa vara, spina bifida, etc. He thought that in common with the latter it was probably an example of mutation.

#### **Grave Familial Jaundice in an Infant.—REGINALD C. JEWESBURY, M.D.**

J. W., a male infant, admitted to St. Thomas's Hospital when aged 2 days, on account of jaundice.

*Family History.*—Both parents healthy. No history of jaundice in parents' families. First child, no jaundice, now alive and well. Second child (premature: 7 months), jaundice within six hours of birth; died. Third child (full term) was jaundiced after birth; now alive. Fourth and fifth (twins, premature: 7 months), both jaundiced; both died.

*Condition on Admission to Hospital:* A deeply jaundiced but vigorous baby. Weight 6 lb. 1 oz., the only abnormality being enlargement of the spleen, which was uniformly enlarged and could be felt 2½ in. below the left costal margin. Liver not enlarged. Meconium was passed and the napkins were stained yellow.

*Progress:* On the evening of admission 8 c.c. of whole blood were injected intramuscularly into the buttocks. Only a single blood injection was given. The jaundice at first deepened, but gradually faded to a pale lemon-yellow tint. There were no haemorrhages; the spleen decreased in size. The child was breast-fed—four-hourly—and sucked well. The birth weight was regained on the tenth day, but after this no gain was recorded, the weight tending to drop slightly. Weight at one month was 5 lb. 15½ oz. There was no fever.

*Blood-count:* R.C., 2,560,000; Hb., 52%; W.C., 26,000. *Differentials:* polys., 49%; large lymphos., 34·5%; small lymphos., 4%; eos., 4%; large hyals. 2%; neutrophil myelos., 0·5%; normoblasts, 76; myeloblasts, 6 in 200 leucocytes; polychromatophilia. + + +.

*Examination of Urine* (Dr. de Wesselow): Urine contains bilirubin, no appreciable urobilinogen. More suggestive of obstructive than of haemolytic jaundice.

*Examination of Stools:* Bile present; no concealed blood. Sachs-Georgi reaction: mother's negative, child's negative.

*Treatment:* Apart from the one injection of whole blood and the administration of iron, in view of the anaemia, no further treatment was given. The child remained in hospital for one month and is now attending the out-patient department.

*Discussion.*—Dr. CHODAK GREGORY said she thought that Dr. Jewesbury's doubt with regard to the diagnosis of familial icterus gravis neonatorum was due to the presence of bilirubin—rather than of urobilin—in the urine; but though, as a rule, in these cases there was no definite cirrhosis, cases had been recorded in which it had been present in one or two members of the family who had died of the disease.

She suggested that this baby should be treated with the serum of its mother, because she believed that out of all the families which had been reported, the only one in which every child had survived was that recorded by Hampson, in which a dose of the mother's serum—not the whole blood—was given to each child immediately after birth. It was difficult to know why this treatment should do good, especially if the theory that the condition was a mother's toxæmia was correct. She suggested that this child should have injections of glucose to tide it over the time until the liver was able to fulfil its functions.

Dr. PARKES WEBER asked whether Hampson's good results<sup>1</sup> in cases of "icterus gravis neonatorum" had been as yet confirmed by any other writer. He did not think that that author referred specially to anaemia in his cases. He (Dr. Weber) would compare Dr. Jewesbury's cases to the series of cases described by Buchan and Comrie (*Journ. Path. and Bact.*, 1909, xii, 398), in which anaemia was a most striking feature.

He also asked whether increased fragility of red cells was said to occur in icterus neonatorum; he did not think so. If the fragility were increased, it would suggest that the case in question belonged to the group of familial hemolytic jaundice and was not an example of familial "icterus gravis neonatorum."

Dr. HELEN MACKAY said that the types of jaundice in new-born babies were not yet clearly differentiated. The so-called "physiological jaundice" of the new born seemed to merge into a more severe type in which jaundice persisted for a period considerably longer than was usual in "physiological jaundice," and in these cases the infants probably showed a greater fall in haemoglobin level than other infants of similar birth weight, and might become markedly anaemic. She thought it probable that these cases were due to the same causes which brought about "physiological jaundice," whatever those might be.

She had recently seen an example of another type,—possibly due to intra-uterine infection, although the mother gave no history of pyrexia while pregnant. The infant was born jaundiced, had an enlarged spleen and developed anaemia, but at no stage was it severely ill. It recovered without treatment, and clinically the condition could not be described as "icterus gravis" in the literal meaning of that term.

Dr. JEWESBURY (in reply) said he did not accept the suggestion that the condition might be merely icterus neonatorum, for in that case the spleen would not be so much enlarged as it had been, and still was, in this case in which, at first, it had extended 2½ in. below the costal margin. He recalled a case, probably icterus neonatorum, in which jaundice persisted 2½ months, the spleen was not enlarged, and the jaundice cleared up and left the child none the worse. In the present case the fact that the spleen was so much enlarged and that there was jaundice with severe anaemia made it seem that this was independent of any hereditary toxic condition, but it might be entirely a splenic disease, just as acholuric jaundice was. If the spleen was removed early, the condition might possibly be cured by splenectomy.

He thought Dr. Chodak Gregory's suggestion to give the mother's serum to the child—if it was due to toxæmia in the mother—was worth considering. Till now, he had been satisfied with giving the mother's milk, and the baby had done well on this so far as the jaundice was concerned. The mother thought that the child was now gaining weight. If he did not continue to do so he (the speaker) would consider the giving of more blood-injections.

He did not know how ordinary icterus neonatorum could be recognized, except from the fact that it was an icterus which occurred in a perfectly healthy baby, and lasted usually only ten days, afterwards clearing up without any other signs, whereas in the grave forms of jaundice, there was an enlargement of the liver or the spleen, or some alteration in the blood.

<sup>1</sup> A. C. Hampson, *Lancet*, 1929 (i), 429.

**Facio-scapulo-humeral Muscular Dystrophy (Landouzy-Déjerine) Type.**  
—REGINALD C. JEWESBURY, M.D.

R. P., a girl, aged 15 years. First seen when aged 7 years.

*Past History:* A healthy baby. Walked at 18 months. Mouth held open since 2 years old; dribbles. Face entirely expressionless. No power of facial movement, except slight puckering up of nose when she attempts to smile. Unable to



FIG. 1.



FIG. 2.

Facio-scapulo-humeral muscular dystrophy. (Dr. Jewesbury's case.)

FIGS. 1 and 2.—Face completely devoid of expression; lips widely separated, owing to lack of facial muscles.

close eyes. Wasting of muscles of shoulder girdle, especially pectorals and scapular muscles. She first came under observation eight years ago—since then the condition has been slowly progressive, and now there is weakness and wasting in muscles of back and legs. Intelligence poor. Menstruation began at the age of 9 years and 6 months.

*Family History:* Normal. Two other children, normal.



FIG. 3.



FIG. 4.

*Facio-scapulo-humeral muscular dystrophy. (Dr. Jewesbury's case.)*

FIG. 3.—Showing weakness of facial muscles, atrophy of muscles of shoulder-girdle and marked lordosis, due to weakness of spinal muscles.

FIG. 4.—Showing weakness and atrophy of scapular muscles.

#### *Amyotonia Congenita.*—A. G. MAITLAND-JONES, M.D.

J. G., male, aged 2 years. Admitted to the London Hospital on January 21, 1930, with bronchitis. The mother stated that he was unable to walk or pull himself up into a sitting position. Only within the last four months has he been able to hold his head up unaided.

*Family History.*—Parents healthy. Five children. Eldest girl, aged 8, alive and well. Two other children, males, have died from "bronchitis," one at the age of 15 months, the other at 22 months; neither of them was ever able to walk.

*On Examination.*—Poorly nourished. General hypotonia. The child's limbs can be placed in various abnormal positions. The hypotonia is more marked in the upper limbs than in the lower. Tendon reflexes absent. The muscles of the shoulder-girdle are very small and the upper arm muscles are less developed than those of the lower arm.

*Remarks.*—Because of the small size of the proximal muscles when compared with the distal—particularly noticeable in the upper extremities—this child may be an example of a case showing a connection, clinically, between amyotonia congenita and Werdnig-Hoffmann's disease.

*Discussion.*—Dr. CHODAK GREGORY asked what was the condition of the knee-joint in this child, and whether it was usual for a joint to be affected in amyotonia. Was the knee condition a reason why the child did not walk?

Dr. MAITLAND-JONES (in reply) said that there was very little hypotonia in the lower limbs, and he did not think this would have prevented the child walking, as it was only within the last two months that he had been able to sit up. He (the speaker) had not noticed anything wrong with the knee-joint.

Dr. HELEN MACKAY said that she had had a case—which she had at first wrongly diagnosed as one of amyotonia congenita—in which the signs had been very similar to those present in Dr. Maitland-Jones's case. About 1923 the child had been brought to the Queen's Hospital for Children, from the out-patient department of another hospital, where the condition had been diagnosed as rickets. She had, however, been unable to find any signs of rickets. The child, then in its second year, had extremely flaccid muscles, and much muscular weakness; and the knee-jerks were absent; the mother stated that it had been very late before he could hold up his head. That case had turned out to be one of pseudo-hypertrophic muscular dystrophy. Possibly the condition in this present case might prove to be the same. The calf muscles were distinctly firmer than the very soft muscles of other parts of the body.

## Clinical Section.

[April 11, 1930.]

### Unusual Ossification of the Patella with Symptoms ? due to Osteochondritis.—HAROLD EDWARDS, M.S.

D. H., girl, aged 12, for several months past has complained of pain in left knee, especially marked after exercise. For some time this had been regarded as due to tuberculous arthritis. When first seen, there was a fullness immediately below the patella on the affected side as compared with the right, and a definite point of tenderness at the lower margin of the left patella in the midline. The patient is a very big girl for her age, and is otherwise healthy. A skiagram shows abnormality of the patella on both sides. There is an additional centre of ossification in the upper part of the infrapatellar tendon. On the right this centre is not completely separate from the main bone, but on the left the division is complete. On the left, the opposing edges of the two centres are definitely irregular, and correspond with the appearance seen in osteochondritis in other regions. The physical signs and the skiagram both suggest a diagnosis of osteochondritis at the union of an abnormal centre of ossification of the patella with the main bone.

### Rupture of the Lower Tendon of the Biceps in a Tabetic Patient.—HAROLD EDWARDS, M.S.

D. B., male, aged 50, has suffered from tabes dorsalis for several years, and is still under treatment for this disease. For the past three years he has noticed a change in the appearance of the right upper arm on flexion of the elbow. The change appears to have been gradual. There is no history of trauma. The condition has caused no inconvenience.

On examination, little difference is to be noted between the two arms when relaxed. On flexion, the right biceps forms a prominent swelling high up on the arm. No interruption of the lower tendon can be felt, but it can be traced down to its insertion as a thin flat band. The biceps is well developed, and there is little difference in power between the two sides. Hüter's sign is absent.

*Discussion.*—Dr. J. W. CARR (President) asked what "Hüter's sign" was. Also whether the rupture of the muscle was really due to tabes. If so, was it not a very rare consequence of that disease?

Mr. E. MORTIMER WOOLF said that on examining the biceps as it was contracting, he thought there was a definite hernia of the outer side of the muscular belly. Instead of contracting as a lump—as in rupture of the biceps tendon—there was a lateral spreading, and a kind of hour-glass constriction half-way up, as if part of a muscle was coming through an aperture. He thought the sheath of the muscle had ruptured, and that this caused the appearance. It was difficult to believe that there could be anything wrong with the muscle itself, as its contracture was so strong. He had never seen a rupture of the lower part of the tendon of the biceps; those he had examined had been in the upper part, and the belly of the muscle had moved considerably downwards.

Mr. PAUL BERNARD ROTH said he considered that there was a partial rupture of the biceps. For nine years this man had been a professional boxer, and he still did ball-punching for fifteen minutes every morning. One day, no doubt, the rupture had occurred, and the daily punching had increased it. Rupture of a muscle was common among boxers. The fact that the patient had had syphilis had probably no bearing on the case.

Mr. B. WHITCHURCH HOWELL said he thought that there was partial rupture of muscular fibres, not of the tendon itself. The continuity of the tendon seemed to be complete, but there appeared to be a partial separation of the digitations of the muscle higher up.

Dr. E. STOLKIND said that there were on record cases of muscular hernia in tabetics, due to rupture of the aponeurosis or of the tendon.

Mr. EDWARDS (in reply) said that so far as he had been able to ascertain, the only changes which could occur in association with tabes were gummata in the tendons, these predisposing to rupture. He said in these notes that the rupture was associated with tabes, because tabes was stated in the literature to be one of the most important predisposing causes of muscle rupture. He had not seen a similar case. In reply to the President: Hüter's sign indicating rupture of the biceps was that flexion was more powerful with the forearm in pronation than in supination.

In answer to Mr. Mortimer Woolf, the muscular prominence was not a real hernia, but a pseudo-hernia, as it was only apparent when the muscle was contracted. Nor did he think it was a partial rupture. The muscle had not lost its normal contour, except to the extent one would expect; the lower attachment was weakened, the muscle had undergone permanent shortening, and there was no evidence of irregularity in the muscle. It was, he thought, a stretching of the tendon.

He knew the man was a boxer, but was not aware that he had punching exercise each morning at present.

#### **Carotico-cavernous Aneurysm.—JULIAN TAYLOR, M.S.**

M., male, aged 22. In September, 1928, he fell 26 ft. into the hold of a ship. He "fractured both wrists" and was "unconscious for three hours"; he remembers nothing between the act of removing battens from a hatchway and waking up in his bunk.

Three months later a swelling appeared above the left upper eyelid, and patient began to complain of double vision when looking to the left. Thirteen months after the accident he noticed that vision was not clear in the left eye; since that time his sight in that eye has become progressively worse, both for near and distant vision. He has had no headache and no noises in the head.

*Condition on Examination.*—There was exophthalmos on the left side with a pulsating swelling above the left upper eyelid. On palpation this swelling was felt to be a tortuous and dilated vessel whose path could be traced from the region of the supra-orbital notch around the inner canthus to the upper half of the course of the left angular vein. Pulsation and thrill were present in the swelling. Vascularization of the sclera. No cyanosis of the face or eyelids.

On auscultation a loud to-and-fro murmur was heard over the swelling and the neighbouring part of the frontal bone. It was a rough murmur with a whistling element, and was conducted over the whole skull and along the course of the angular and facial veins. A systolic murmur was heard over the aortic area of the heart. The heart was enlarged, the impulse being palpable in the fourth and fifth spaces as far outwards as the nipple line. The first heart-sound at the apex was sharp, but no murmur was heard there.

The pulse was of the collapsing variety though not definitely "water-hammer." Pressure on the left carotid over the sixth cervical transverse process caused disappearance of the thrill and pulsation, but the murmur did not quite cease.

The fundus oculi shows some swelling of the disc with distension of the veins which pulsated. The arteries were collapsed.

The question of the propriety of operation was carefully considered as the only possible procedure was that of carotid ligation. Obviously such an operation might be followed by right hemiplegia and aphasia, the patient being right-handed, a grave risk to run in a man aged 22, otherwise well. It was thought that the speech centre being extremely sensitive might give some indication of its vulnerability by temporary compression of the common carotid. It was therefore determined to operate under local analgesia, and to compress the carotids on the left side temporarily before ligating them. This was done on April 4, clamps being placed on the left external and internal carotids for about half an hour. No speech defect

or hemiparesis occurred and the external and internal carotids were accordingly ligated. There was immediate cessation of pulsation, thrill and murmur. Two days later there was intermittent pulsation and thrill and a faint murmur over the supra-orbital ridge. During the succeeding days these had lessened, and there was now hardly any pulsation or thrill and a low murmur. The exophthalmos was also receding. It was not hard to understand why there should be a return of the abnormal circulation during the days following the operation, but it was difficult to see why there should be a subsequent recession of the symptoms.

With regard to the question of the onset of hemiplegia, statistics of its frequency following carotid ligation have been published. But statistics are of less importance in considering a particular patient than the cause of the necessity for operation. Where an aneurysm is present the circulation distal to it is always reduced, that is to say, a compensatory circulation has already been partly established. It follows that carotid ligation for aneurysm is less likely to prejudice the cerebral circulation than carotid ligation for other conditions, e.g., during the removal of carotid body tumours. Examples have, however, been published in which carotid ligation for aneurysm has been followed by hemiplegia, but I think this is a rare sequence.

*Discussion.*—Mr. MORTIMER WOOLF asked why the common carotid was not selected for ligation.

Mr. JULIAN TAYLOR (in reply) said that ligation of the common carotid did not stop the blood supply to the cranial cavity on that side, on account of the free anastomosis that existed between the distributions of the two external carotids, which permitted blood to pass from the external to the internal carotid above the ligature. The anastomosis in question was demonstrated by the not uncommon failure of external carotid ligation to check permanently secondary haemorrhage from the mouth or nose. Ligation of the internal carotid abolished the blood supply to the circle of Willis on that side, and ligation of the external carotid aimed at checking the supply through the orbit. This source was likely to be soon re-established, and he was considering the propriety of ligation of the opposite external carotid in addition.

#### Hæmochromatosis.—H. V. MORLOCK, M.D.

Male, aged 52. For the last three years patient has noticed a peculiar colouring of skin and increasing weakness. During the last few months has suffered from pain in the right hypochondrium.

On examination the colour of the skin is brownish-blue. There are numerous dilated venules on the cheeks. The conjunctivæ are slightly icteric. No pigmentation of the buccal mucous membrane. Heart normal. Lungs: right base behind, impaired percussion note and diminished air entry. Liver enlarged to 3 in. below umbilicus, firm and uniform to palpation. Spleen not palpable. No ascites. No glands palpable. Urine: No sugar; bile-pigments absent; excess of urobilin.

Blood: R.C., 5,470,000; W.C., 15,000; Hb., 86%; C.I., 0.8. Polys., 72%; lymphos., 23%; monos., 4%; eos., 1%.

Van den Bergh test: Direct, negative; indirect, positive (3 units). Wassermann reaction in blood negative. Blood-sugar curve: Fasting, 0.093 grm. %; half-hour after administration of 50 grm. glucose, 0.181 grm. %; one hour after, 0.216 grm. %; one and half hours after, 0.212 grm. %; a mild diabetic curve.

Shred of skin removed from upper arm shows deposit of iron in deeper layers (ammonium sulphide).

The presence of hæmosiderin in the section of the skin clinches the diagnosis of hæmosiderosis.

The case is of particular interest because it showed the presence of hæmosiderosis before the diabetic symptoms had become established, thus confirming the opinion that the pancreatic changes were secondary to the cause of the hæmosiderosis. With regard to the aetiology of the condition: Mallory, in a series of nineteen cases, found an alcoholic history in seven, four had worked with copper,

eight gave no aetiological clue. Mallory suggested that copper acted as a haemolytic agent in this disease. But there is considerable evidence against the theory of haemolysis as a cause of the haemosiderosis: (1) These cases do not present an anaemia. (2) None of the tests for haemolysis is positive. (3) Post mortem there is no evidence of activity in the bone-marrow and haemopoietic system. (4) In haemolytic conditions at post-mortem the haemosiderosis is found in the bone-marrow and spleen, while in these cases the liver and pancreas are the organs affected. (5) There is evidence of retention of food iron in haemosiderosis.

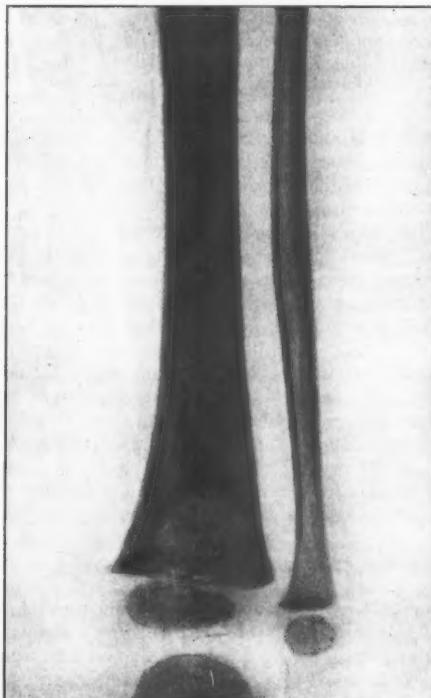
The aetiology in the majority of cases, as in this case, is obscure.

*Discussion.*—Dr. NORMAN HILL said that the sugar curve was given, but the exhibitor did not say whether glycosuria occurred after the administration of the glucose. If it did not, he presumed that the patient was a diabetic with a high leak-point. Had Dr. Morlock dieted the patient with the view of bringing his blood-sugar under control? If this had been done, what had been the effect on the man as to feeling of well-being and as to weight?

Dr. MORLOCK (in reply) said that when the blood-sugar curve rose above 0·181 grm. there was sugar in the urine. With regard to diet there was some evidence that if one could keep the liver cells full of glycogen, the liver cells obtained some protection; with that in view, the patient had been taking 40 grm. of glucose in water twice a day, and sufficient insulin had been given to control this increase in the sugar which he had taken, with the idea of increasing the glycogen in the liver.

#### **Isolated Abscess in the Tibia of a Child.—CECIL P. G. WAKELEY, F.R.C.S.**

Alex. H., aged 2 years, has suffered from weakness in left leg since age of 9 months. Did not begin to walk until age of 18 months. Full-term baby; weighed 8 lb. at birth. Normal labour.



Isolated staphylococcal abscess of tibia. (Mr. Wakeley's case.)

Cries a great deal and appears to have some pain in leg.  
Some swelling over lower part of left leg.

Skiagram shows central cavity in diaphyseal end of tibia. No sclerosis or rarefaction in surrounding bone, and no evidence of any trabeculation in the cavity. No periosteal disturbance. Cavity approaches but does not invade epiphyseal line. No sign of rickets.

This child did not begin to walk until he was 18 months old. There was no sign of rickets, and the skiagram taken shows the rather clear-cut abscess cavity. In the latest skiagram there is seen to be a thickening of the periosteum on either side, which I take to be diagnostic of a pyogenic infection rather than of tuberculous disease of bone. The abscess does not seem to have come through the epiphyseal line. I think it is staphylococcal.

*Discussion.*—Mr. B. WHITCHURCH HOWELL said he agreed with Mr. Wakeley that this was a staphylococcal infection of the bone and was not tuberculous.

Mr. PAUL BERNARD ROTH said that he felt sure the case was one of acute infection of bone which had aborted. Some infective material was left, and at some time it would have to be opened and scraped, as the condition would not clear up otherwise.

Mr. JULIAN TAYLOR said that Mr. Wakeley had laid stress on the absence of affection of the epiphysis as influencing the diagnosis in this child. Diaphyseal staphylococcal infection frequently crossed the epiphyseal plate, as was also the case in tuberculosis.

He did not remember having seen Brodie's abscess in so young a child, but in older patients this abscess usually took the form of an elongated cavity passing up the shaft for some distance. As to whether the age of the patient might so alter the reactions to infection as to change the shape of the abscess cavity, producing a rounded one instead of the more usual elongated one, he would not like to offer an opinion.

With regard to treatment, he usually opened such abscesses, removed the lining, and immediately closed the wound. Only on one occasion had he known union by first intention fail to occur after such treatment.

Mr. WAKELEY (in reply) said that he thought the epiphyseal plate was more frequently involved in tuberculous than in staphylococcal infection. He did not agree with Mr. Julian Taylor that the typical Brodie's abscess was elongated; in his own experience it was circular, with a big layer of condensed bone all round it.

*Postscript.*—Operation, April 14, 1930. The abscess cavity was opened. The organism obtained was the *Staphylococcus pyogenes aureus*.

#### Eighth-nerve Tumour Ten Years after Suboccipital Decompression. —CECIL P. G. WAKELEY, F.R.C.S.

Cecil B., aged 15 years, was admitted to King's College Hospital, July 20, 1920, with well-marked signs of a cerebellar tumour—headaches, double optic neuritis and vomiting. Some incoördination and fine tremor of the hands. Diminution of air conduction on right side, but results of other hearing tests were normal.

Large subtentorial decompression carried out July 27, 1920. Intracranial pressure much increased. No tumour seen. Discharged August 18, 1920, much improved. No headaches or vomiting. Optic neuritis completely disappeared.

Seen again in 1925. No symptoms. Very slight hernia through cerebellar fossae.

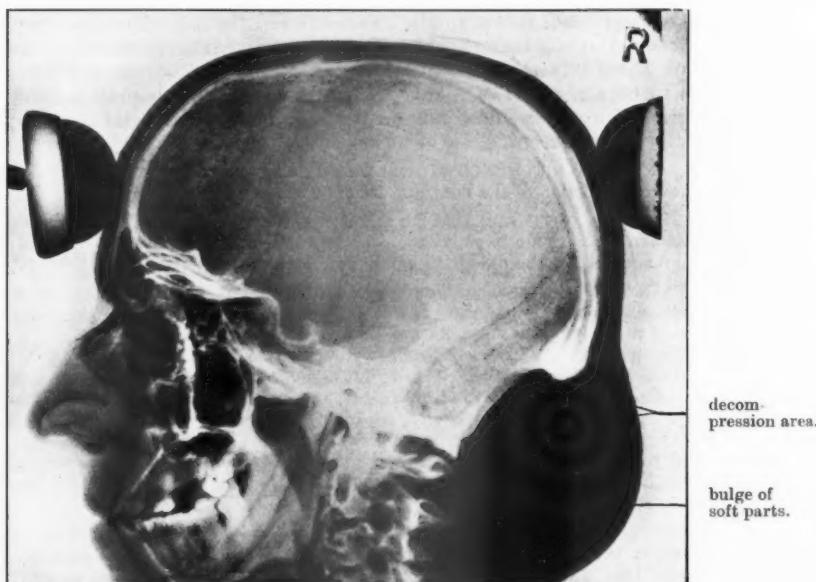
Not seen again until March, 1930, when he came to hospital complaining of pain in back of head. On examination it was found that the hernial protrusion of the cerebellum was more tense, and there was marked deafness in the right ear.

There is a fine nystagmus on looking up, and to the left. On looking to right nystagmus is slow and coarse. Left corneal reflex more brisk than right. Eye movements normal. Discs normal.

Hearing: Right, hears watch at two inches. Left, hears watch at three feet. Tuning fork: Right, B.C. > A.C.; left, A.C. > B.C.; Weber to right.

Cotton-wool and pin-prick sensations diminished on right side of face. Some weakness of right side of face on voluntary movement. When patient stands with eyes closed head bends to left.

Dysdiadochokinesia, right hand and forearm. Coördination weaker on the right side.



Lateral skiagram of skull ten years after subtentorial decompression. (Mr. Wakeley's case of eighth-nerve tumour.)

At the operation there was a great increase in pressure, and I was not satisfied that there was no tumour in the cerebello-pontine angle or the internal auditory meatus. The skiagram shows how much the cerebellum is bulging through. Most of the bulging is probably fluid, not actual brain matter. On the right side the internal auditory meatus is opened up; it is wider, and the bone is destroyed. This is diagnostic of eighth-nerve tumour. Should one do anything now, or not? The patient is in good health and is working all day long, and though there are signs of this tumour, it is, I think, of very slow growth, and best left alone.

*Discussion.*—Mr. JULIAN TAYLOR advised that nothing further be done.

Dr. J. PURDON MARTIN said that, speaking as a physician, he agreed with Mr. Julian Taylor that further interference would be unjustifiable. The patient was now doing very well, and function was good, and it was unlikely that further operative measures would do any good.

#### **Double Coxa Varo, after Treatment.—PAUL BERNARD ROTH, F.R.C.S.**

C. K., female, aged 23. First seen March, 1921, when 14 years old. The skiagram showed severe double coxa varo. She was admitted under the care of Dr. Pugh at Carshalton, where she was kept recumbent, with thighs abducted, for thirteen months.

She returned to my care in June, 1922, wearing a pair of Thomas's calliper knee splints, which were discarded in the following September. In November, 1922, she could walk without a limp.

She was not seen again until July, 1929, when she came to ask advice about one of her children. She told me she had two children, aged  $3\frac{1}{2}$  and  $4\frac{1}{2}$  years: the labour had been difficult in each case.

A skiagram taken January 17, 1930, showed both femoral angles at  $90^\circ$ .

She walks without a limp and is able to do everything about the house, but kneeling is difficult: when she has to do this she crosses the left lower leg in front of the right knee, putting all the weight on the latter.

Considering the severe character of the original deformity, the present condition is very satisfactory.

**Leontiasis Ossea.**—M. A. BLANDY, M.B., M.R.C.P.

Mrs. M., aged 64. *History.*—A photograph taken ten years ago shows slight enlargement of right side of face and broadening of cranial vault. Patient herself only noticed enlargement of right side of face three years ago. She attributes it to dental extractions.



LEONTIASIS OSSEA.

Skiagram of pelvis showing decalcification and abnormal transparency (Dr. Blandy's case).

Deafness in left ear since mastoidotomy eighteen years ago, but which has been increasing in right ear during last three years.

Headaches, occasionally; giddiness and unsteadiness for six months. Vision unaffected.

*Examination.*—A very small woman with a huge head. Height, 4 ft. 7½ in. Skeleton : Maximum circumference of head, 24½ in. Enlargement of cranial vault and right side of face, the latter due to involvement of right superior maxilla and malar bones. Alveolar margins and hard palate are much thickened on right side; hard palate is extended posteriorly so that very little soft palate is visible. The mandible escapes entirely. No enlargement of hands and feet or palpable involvement of long bones.

*Nervous System.*—Cranial nerves. (i) Smell retained. (ii) Optic nerves normal. (iii, iv, vi) Nystagmus on lateral deviation; quicker to left. Some difficulty in looking to the left, but no paralysis. (vii) Right facial paresis and clonic facial spasm. (viii) Deafness of middle-ear type, severe; more intense in left ear. (?) Vestibular ataxia.

Gait unsteady. Tends to fall to left. Right hand and arm show some deep loss of sense of position. Deep reflexes much exaggerated. Superficial reflexes normal.

Wassermann reaction negative. Glycosuria occasional. Fasting blood-sugar, 117 mgm., with an augmentation to 253 mgm. half an hour after 100 grm. glucose, 210 mgm. after 1½ hours with glycosuria. Blood-calcium, 10·8 mgm.

*Skiagram.*—Skull : Great thickening, mottling, increased density of calvarium. Area of rarefaction between two knob-like hyperostoses which appear to be growing from inner table in right frontal region. Right maxilla and malar show mottling and enlargement. Pituitary fossa enlarged and flattened. Osteitis present, moderately, in innominate bones, sacrum, fifth lumbar vertebra, upper end of right femur, and a few of the small bones. The shafts of the long bones are unaffected, but there is general decalcification and abnormal transparency. Skiagrams of the rest of the body show similar disease in the pelvis, sacrum and upper part of the right femur and the small bones.

There is none of the pain usually associated with Paget's disease. This case seems to combine the physical signs of the two diseases.

*Discussion.*—The PRESIDENT asked if Dr. Blandy regarded the case as possibly a modified form of Paget's disease predominantly affecting the head. Also, whether she thought that the disease was at all likely to lead to the subsequent development of sarcoma of the bone.

Mr. CECIL WAKELEY said he thought that, pathologically, osteitis deformans, leontiasis ossea, and osteitis fibrosa were linked together. But there was not sufficient material available to enable one to be dogmatic about the pathology. He had never seen leontiasis ossea and Paget's disease associated, but probably they might occur in the same patient.

Mr. MORTIMER WOOLF said that at the last meeting of the Section he had shown a case of osteitis deformans with tumour of the right buttock, on which various opinions were expressed. Some Members had thought that it was an abscess, but he considered it to be a sarcoma. He had subsequently put in a needle but nothing had come away. He regarded the skiagram in the present case as typical of secondary deposit in bone, and there was the appearance presented by carcinoma of the breast. If he had seen the pelvis alone, without having any particulars of the case, he would have said that there were secondary deposits of malignant disease.

Dr. BLANDY (in reply) said she considered that the distinction between the various conditions mentioned by the President was mainly clinical. Leontiasis began in the face

and skull, and it was only by X-ray examination that the other bones were found to be affected. In other bones there was nothing to be felt clinically.

**Fracture, with Intra-articular Dislocation of the Internal Condyle of the Humerus occurring Conjointly with Dislocation of the Elbow.—A. E. MORTIMER WOOLF, F.R.C.S.**

V. F., a girl, aged 15, had a fall on pavement August 2, 1929, falling on to right hand. Elbow was said to be dislocated; reduction performed.

Seen by me August 10. Considerable swelling of elbow, which was flexed to a right-angle; only a few degrees of flexion and extension obtainable.



Fracture, with intra-articular dislocation of internal condyle of humerus. Four months after operation. (Mr. Mortimer Woolf's case.)

X-ray examination showed that the internal condyle had been knocked off, was displaced downwards and outwards and was inside the joint.

Operation, September 21, 1930. An internal incision was made, the joint opened and the piece of bone, with the flexor muscles, levered out of the joint. This was fixed as nearly as possible into its normal position by driving a nail upwards and outwards through the fragment into the shaft.

The present result is very satisfactory; there is nearly full flexion and only slight limitation of extension. There is, however, some grating on the inner side on

movement of the elbow and it is now proposed to remove the nail. The skiagram shows an almost perfect anatomical result.

*Discussion.*—Mr. CECIL WAKELEY asked if Mr. Mortimer Woolf, in nailing the fragment back into position, which was inter-articular, sewed up the capsule before putting the nail in. There were now some muscle fibres which had become fibrosed, running over the nail, and there was  $\frac{1}{4}$  in. of nail outside the bone.

Mr. MORTIMER WOOLF, in reply, said he did not sew up the capsule. After nailing, he had put in a deep suture in order to bring the parts together.

## Section of Anæsthetics.

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MEETING HELD AT THE WELLCOME MUSEUM, APRIL 2, 1930.

**Henry Hill Hickman.**

By the Right Hon. **LORD DAWSON OF PENN, P.C., G.C.V.O., M.D.**  
(President of the Society).

IT is fitting that a meeting of this Section of Anæsthetics, having for its purpose the praise of famous men and the appraisement of their deeds, should take place in the Wellcome Historical Medical Museum.

Our distinguished honorary Fellow, Mr. Wellcome, places in full measure running over, not only his resources but his time and constant encouragement, at the service of Medicine, and this Museum is made to live by the inspiration of its conservator, Mr. Malcolm.

The commemoration which we celebrate this evening and on April 5 owes its fruition to the enthusiasm and vigour of Dr. Cecil Hughes. But for him, I should not have the honour of addressing you to-night. Who could say him nay? Due to him and his colleagues, we are doing honour where honour is due.

Far back into the beginnings of history there existed the desire and effort to find relief from pain and suffering. These sedative and even pleasurable effects were produced by such drugs as opium, hyoscyamus, mulberry, hemlock, hemp, and notably mandragora, which appears to have been allied to mandrake.

Mandragora may have been what Helen cast into the wine—"a drug to lull all pain and anger and bring forgetfulness of every sorrow." It was used by the Jews to deaden the agonies of the victims of crucifixion; its infusion in wine was stated by Dioscorides, of the early Christian era, to deaden the pain of operations. Galen, too, in the second century, knew of mandragora having the power to "paralyse sensation and motion."

The desire to secure insensibility to pain had existed from the earliest times. Before the removal of his rib, the Lord "caused a deep sleep to fall upon Adam." And perhaps I may pause a minute to recall to your mind that this precedent helped to appease the minds of preachers and people who in the nineteenth century denounced the use of chloroform for the relief of the pains of childbirth as contrary to Holy Writ and as an impious evasion of the primeval curse upon women. So where reason failed an irrelevant precedent succeeded.

Throughout the Middle Ages and later centuries potions, or the vapour of such potions, were used to deaden pain and promote insensibility. Says Iago in *Othello* :—

"Look where he comes! Not poppy, nor mandragora,  
Nor all the drowsy syrups of the world,  
Shall ever medicine thee to that sweet sleep  
Which thou ow'dst yesterday."

On the other hand, in the latter part of the eighteenth century, pain seemed to be accepted as an inevitable accompaniment of surgical practice, and this same apathy in the early part of the nineteenth century delayed for years the discovery of inhalation anaesthesia being made available to mankind.

Anæsthesia, as we now know it, owed its origin to the discoveries of Lavoisier—the great philosopher, who at the age of 51, and in the year 1794, was sent to the guillotine by the revolutionary tribunal; to the discovery of hydrogen by Cavendish in 1766, of nitrogen by Rutherford in 1772, and of oxygen by Priestley in 1774. Thus became known the nature of combustion and the process and purpose of respiration. Lavoisier rid chemistry of the hypothetical "phlogiston," and the great advance

of chemical knowledge in his day, without which inhalation anaesthesia could not have materialized, is illustrated by the fact that amongst original communications for which he was given a gold medal from the Academy of Science was "a refutation of the prevalent belief that water by repeated distillation is converted into earth." The discovery of nitrous oxide by Priestley about 1774 was followed in the year 1800 by the further and equally important discovery of its anaesthetic properties by Humphry Davy.

To stop for a moment to appraise the work of Humphry Davy is germane to my theme that a discovery is often due to the genius and efforts, both fruitful and unfruitful, of a succession of workers. This is especially true of anaesthesia. The credit for its discovery belongs more to the early workers than to those men of reputation who, after a lapse of many years, made available to mankind the blessings of ether, nitrous oxide and chloroform. It is hardly too much to say that at long last the world tumbled into anaesthesia.

Humphry Davy, once an apprentice to an apothecary in Cornwall, was fired to the study of chemistry at the age of 19 by the writings of Lavoisier. A year later, i.e., 1798, he was appointed assistant to Dr. Beddoes, who had an institute at Bristol for treating various diseases by inhalation of gases, especially phthisis. The same year found Davy experimenting with nitrous oxide. First, he noticed that the gas "produced no uneasy feeling in the lungs," then that the inhalation of three quarts was followed by a loss of a distinct sensation of voluntary power. Finding there were no after-effects he continued, and discovered that, after breathing six or seven quarts, sometimes muscular movements were produced, and at other times he felt a sense of pleasure, which was manifested by laughing and dancing. Next he removed a headache, then the severe pain from a tooth, and then, after a journey of 126 miles—no mean performance for a poor man in those days—he found the gas gave him a pleasant propensity to sleep. Next, in order of time, he administered the gas to a young lady, who thereby temporarily lost consciousness and had recovered in a quarter of an hour. A year later, viz., 1799, he investigated the effects of nitrous oxide on animals, and in 1800 published his researches in an interesting book, on p. 556 of which occurred this notable pronouncement: "As nitrous oxide in its extensive operation appears capable of destroying physical pain, it may probably be used with advantage during surgical operations in which no great effusion of blood takes place."

Humphry Davy had discovered the idea, but the suggestion fell on deaf ears.

Again in 1818 Faraday announced that "When the vapour of ether mixed with common air is inhaled, it produces effects very similar to those occasioned by nitrous oxide." The imagination of the medical world still remained untouched.

It is here that we are introduced to Hickman, the centenary of whose death at the age of 29 we commemorate to-night. He began his career as a practitioner in the country town of Ludlow in Shropshire. To him is the credit of appreciating the sufferings inflicted by surgical operations and the conception of means to alleviate them by the production of insensibility.

In a letter dated February 21, 1824, he writes: "I have frequently lamented, when performing my own duties as a surgeon, that something has not been thought of whereby the fears may be tranquillized and suffering relieved." Further, he was the first to put his ideas to the test of experiment. Hickman rendered animals unconscious first through partial asphyxiation by the exclusion of air, then by inhalation of carbon dioxide and, later, of nitrous oxide. During anaesthesia he made incisions, applied ligatures, amputated ears and limbs without pain and with good surgical results. His earnest purpose was to extend the benefit of his findings to man. To this end he published (August, 1824) his famous pamphlet "A Letter on Suspended Animation, containing Experiments showing that it may be Safely Employed during Operations on Animals, with the View of ascertaining its Probable Utility in Surgical Operations on the Human Subject: Addressed to T. A. Knight,

Esqr., of Downton Castle, Herefordshire, one of the Presidents of the Royal Society." This pamphlet, a witness of the scientific spirit and method, is published in full in the Hickman Centenary Book by Malcolm, for the issue of which a debt of gratitude is due, not only to the author, but to the Wellcome Museum.

Hickman's researches were ignored by the medical profession in his own country, in spite of the friendship of Knight for Davy, the then President of the Royal Society, so in April, 1828, he went to Paris and presented to King Charles X a memorial praying that his work might be presented to the French Academy of Medicine. This was done and a commission was appointed. But no investigation followed. The work to which he had sacrificed his career failed of recognition alike in France and England. Hickman returned home and died shortly afterwards at the age of 29. How strange is the continued apathy thus disclosed, and yet it continued for a further thirteen years!

From 1831 onwards a fashion arose of inhaling ether and, to a less extent, nitrous oxide to the point of excitement and even intoxication, for motives of curiosity or fun. For students and other youths such inhalations became a pastime—they were the cocktail parties of the early nineteenth century. Still the scales did not fall from the eyes of the surgeons. During one of such frolics a negro boy was dragged in, and ether administered, with the result that insensibility followed, and despite the—to us—obvious application it was not till 1842 that a young dentist, Crawford Long, used ether for a definite surgical purpose. Then events did follow more quickly.

Wells in 1844 employed nitrous oxide for anaesthesia. Morton, unaware of Long's work, administered ether in Massachusetts General Hospital in 1846—the first public use of anaesthesia. Then, a year later, Flourens, the distinguished physiologist, described the effects of chloroform on the lower animals, and following this chloroform was employed at St. Bartholomew's Hospital by Sir William Lawrence and in Edinburgh by Sir James Simpson, who published the details of fifty cases in which he had administered chloroform with success.

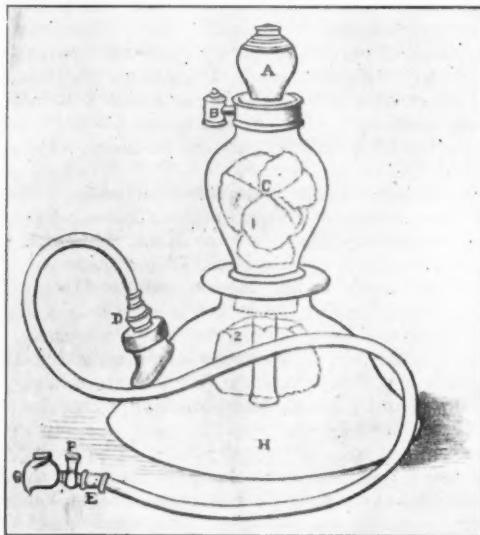
It is interesting to inquire why these many years separated the discovery from the adoption of anaesthesia. Was it because Great Britain was passing through a phase of apathy of mind and perhaps also of feeling which led to insensitivity towards suffering? The necessity and even the pride of rapid operating may have excluded other considerations from surgeons' minds. The great Liston prided himself on being able to amputate a leg at the hip-joint in under a minute. Referring once more to Hickman: though a young country practitioner, he had the mind to see, the heart to feel, what anaesthesia meant for humanity—and strove to move his profession in England and France to action. Honour is his due and it is our privilege and happiness to perpetuate his fame.

**POSTSCRIPT.**—I am indebted to Dr. F. William Cock, of Ashford, for further valuable facts ("The First Operation Under Ether in Europe—The Story of Three Days").

Following the reception from Dr. Bigelow of an enthusiastic account, dated November 28, 1846, of the success of ether anaesthesia in the Massachusetts General Hospital, Dr. Francis Boott, of Gower Street, extracted a molar tooth under ether anaesthesia. The success of this operation prompted Boott to write to Robert Liston who, perceiving the implications of the discovery, immediately sought his friend Peter Squire, the well-known chemist in Oxford Street, and urged him on December 19, 1846, to design an inhaler. By December 21, Peter Squire had the inhaler ready—the upper detachable cylinder being packed with sponge, and to the exit a flexible tube was attached with an ordinary bronchial inhaler mouthpiece. On this same day Liston performed a major amputation under anaesthesia. Dr. Cock's graphic account is worth quoting:—

" . . . the patient is carried in on the stretcher and laid on the table. The tube is put into his mouth, Wm. Squire holds it and the patient's nostrils. A couple of dressers stand

by to hold the patient if necessary, but he never moves, and blows and gurgles away quite quietly. Liston stands by, trying the edge of his knife against his thumbnail, and the tension increases; the patient's breathing gets deeper, more ether is dropped on to the sponge. Wm. Squire looks at Liston and says, 'I think he'll do, sir.' The tube is removed and a handkerchief laid over the patient's face. 'Take the artery, Mr. Cadge,' cries Liston. Ransome, the house surgeon, holds the limb. 'Now, gentlemen, time me,' he says to the students. A score of watches are pulled out in reply. The huge hand grasps the thigh, a thrust of the long straight knife, two or three rapid sawing movements, and the upper flap is made; under go his fingers, and the flap is held back; another thrust, and the point of the knife comes out in the angle of the upper flap; two or three more lightning-like movements, and the lower flap is cut, under goes the great thumb and holds it back also; a touch or two of the point, and the dresser, holding the saw by its end, yields it to the surgeon and takes the knife in return—half a dozen strokes, and Ransome places the limb in the sawdust. 'Twenty-eight seconds,' says Wm. Squire. 'Twenty-seven,' says Buckell, a student still living. 'Twenty-six,' echoes yellow-haired Russell Reynolds. 'Twenty-five seconds, sir.'



Peter Squire's first ether inhaler as finally modified. (By kind permission of Messrs. Squire and Sons, Ltd.).

says proud Edward Palmer, the dresser, to his surgeon, who smiles in reply. The femoral artery is taken up on a tenaculum and tied with two stout ligatures, and five or six more vessels with the bow forceps and single thread, a strip of wet lint put between the flaps and the stump raised. Then the handkerchief is removed from the patient's face, and trying to raise himself, he says, 'When are you going to begin? Take me back, I can't have it done!' He is shown the elevated stump, drops back and weeps a little; then the porters come in and he is taken back to bed. Five minutes have elapsed since he left it . . ." Let us follow the patient for a little, and we cannot do better than again have recourse to the notes: "Not the slightest groan was heard from the patient, nor was the countenance at all expressive of pain. This was the first capital operation which had been performed under the narcotizing influence of ether vapour, and it was perfectly successful. The patient did not know that the limb was removed and declares distinctly that he has no remembrance of having suffered any pain either in the theatre or in coming away. . . . The patient made the usual tedious recovery common in those days, with offensive suppuration and slow granulation. The ligature on the femoral artery came away on the twentieth day. He was discharged cured on February 11, 1847."

## Section of the History of Medicine.

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### The Background of Galen's Life and Activities, and its Influence on his Achievements.

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GALEN was born at Pergamum A.D. 130, at a time when the Roman Empire had reached the zenith of its splendour.<sup>1</sup> Her sway extended over almost all the known world, her legions bivouacked by the waters of Babylon, and tramped in triumph along the Yorkshire moors. The political independence of Greece had ended, and she, with her dependencies, had passed under the suzerainty of Rome.

The history of Pergamum is interesting. Situated in a pleasant fertile valley in the province of Mysia, at the north-west of Asia Minor, and built on the river Caicus, some twelve miles from the sea, it was at an early date the seat of a colony from Arcadia, one of the numerous settlements which the Mother Country established along the sea-board of Asia Minor. Another colony from Epidaurus arrived some time later, and this connection establishes a relationship between the home and centre of the cult of Aesculapios and the provincial town, an association that was destined to have such an abiding influence on the history of medicine.

Pergamum was fortunate in its history. With the expansion of the Macedonian Kingdom, Alexander the Great appointed one of his generals to the command of the city, and through him the governorship passed to Philetaerus, and then to Eumenes, the founder of the Attalid Dynasty. The Attalid rulers, partly by conquest and partly by diplomatic dealings with Rome, extended the influence of Pergamum, until it became a powerful city, exerting its sway over many of the provinces of Asia Minor. Of the Attalid kings, the most renowned is Eumenes II, who founded the famous library, which at one time rivalled in extent and magnificence that of Alexandria. It possessed some fifty thousand volumes. The history of this collection is exceedingly interesting. The Attalid kings were avid collectors, and the zeal of these monarchs was an incentive to unscrupulous dealers to produce spurious and supposititious works, which they foisted on the royal agents. To this circumstance, Galen attributes many of the mutilations and additions that had crept into the Hippocratic text.<sup>2</sup>

Another result provoked by this royal acquisitiveness was the popularization of parchment as a medium for the written word, a sequel to the embargo placed by the Ptolemies on the export of papyri to Pergamum.<sup>3</sup> The word "parchment," i.e., "pergamentum," is, of course, drawn from the name of the city. And yet another consequence, and one of which biologists are perpetually aware, is the damage that befell the Aristotelian text. The library left by Aristotle was at that time kept at Skepsis in the Troad. To save it from the rapacious hands of the royal agents, who paid little regard to the wishes or the rights of private collectors, it is said to have

<sup>1</sup> Dr. Joseph Walsh, of Philadelphia, in a very interesting article has shown that Galen was most probably born on 22nd September of that year (Art. "Date of Galen's Birth," *Annals of Med. Hist.*, Vol. I, pp. 378-382, 1929, New York).

<sup>2</sup> Vol. XV, pp. 5, 105. (The references by volume are to Kuhn's edition of Galen's works, in all twenty-two volumes. Lips. 1821, etc.)

<sup>3</sup> Vol. XVII, A, p. 606.

been buried underground, where it remained for some two hundred years, a prey to moths and worms: "blattarum et tinearum epulae," as Strabo says.

Another glory of the Attalid kings was the fostering care they lavished on the arts of architecture and sculpture. They created magnificent buildings to house their treasures, and adorned them with sculptures of surpassing beauty. A good deal of this has been rediscovered, and some of it, including the "Altar of Zeus," a masterpiece of craftsmanship, may now be seen in Berlin. The "Dying Gaul" in Rome is another well-known example of their sensitive skill. The sculpture created by Pergamum is, in a sense, unique. It shows a sympathy with the suffering of a fallen foe that ancient art had not yet learnt to portray. Pity for the weak and unfortunate is a new note in the outlook of a conquering nation. There are several references to sculpture in Galen's pages, and we learn that even in his day the "canon" of Polyclitus was the rule and norm by which all great achievements were created.<sup>4</sup>

The science of healing possessed in the Attalid kings ready and interested patrons. A great medical school flourished under their patronage. It was a home of the cult of Aesculapios, as the story of its coins testifies. Attalus III, the last of the dynasty, gave a very practical demonstration of his zeal and interest. He made experiments to test the effects of poisons and their antidotes. Such investigations, carried out with a callousness that accords well with his other cruelties, were done on criminals condemned to death.<sup>5</sup>

This King, in his will, bequeathed his kingdom to the Senate at Rome, and thus ended in the year 133 B.C. the sovereignty of Pergamum. Her magnificent library was eventually transferred to Alexandria as a gift from Antony to Cleopatra, and we may be sure that when Galen, at a later date, visited this city, the collection of literature, once the possession and the pride of his fatherland, was not the least of the attractions that drew him thither. Intimate and friendly relations continued to be maintained between Pergamum and Rome, and in the reign of Augustus the citizens of Pergamum were given the honour of being intimately associated with the religious cult of the Emperor.

Many of her citizens, too, played important parts in the public life of the world state and contributed to the spread of her influence and power. For instance, Telephus, a person seemingly of prodigious learning, was one of the instructors of Lucius Verus. Menippus, a distinguished geographer in the time of Augustus, made a survey of the Mediterranean. Artemidorus, a physician, but no credit to his profession, was the creature of Verres. Marinus, a man of different stamp, called by Galen the "restorer of anatomy," is said to have been born at Pergamum. Oribasius, who came at a later date, was also a native of this city. Incidentally one may remark on the absence of any national or racial feeling in such associations; one gathers from Galen's pages that the idea of a cultural superiority was in those days dominant and supreme. And this culture was an all-pervading Hellenism.

Though by the time of Galen's birth this ancient city was shorn of much of its greatness, yet enough of the former splendour survived (as we gather from the remarks of Pausanias) to remind its citizens of the noble traditions of which they were the heirs. It was still a centre of Greek culture. Its medical school still stood, lately embellished and restored by the generosity of one of her citizens.<sup>6</sup>

Let us now look back some years before Galen's birth and observe some of the events which were destined to have such an influence on him and on the world of his day. Since the battle of Cynoscephala, a steady process of Hellenization had gone on in the Roman world until the Greek tongue became the language of culture, and Greek philosophy came to be regarded as the indispensable equipment of those who had any pretensions to learning or any aspirations to fame. As the result, Latin literature was neglected and entered on a steady decline. The Emperors were

<sup>4</sup> Vol. I, p. 566.

<sup>5</sup> Vol. XIV, p. 2.

<sup>6</sup> Vol. II, p. 224.

usually enthusiastic, but often indiscriminating, patrons of Greek art and customs. The antics of Nero and the servility of Hadrian will readily come to mind. Marcus Aurelius, with whom Galen was destined to come into such intimate contact, was Greek in feeling and sympathy. His *Meditations* are written in Greek and his philosophy is the product of Stoicism. Scientific studies, such as they were, were inspired by Greek models and composed in the Greek language. Scribonius Largus, the physician who visited England in the train of Claudius, is said to have written his *Quæstiones Medicae* in Greek, and, at a later date, they were translated into Latin. Incidentally it is interesting to observe that this work may have been composed in this country. Aelianus Claudius, a native of Italy, who lived about the time of Galen, wrote his *History of Animals* in Greek. Julius Pollux, a native of Egypt, whose activities are so typical of this period, was a contemporary of Galen. He also wrote in Greek. It is true that Celsus wrote in Latin, but Celsus was never regarded as being in the stream of progressive thought. He is not even mentioned by Galen. Moreover, he wrote before the influence of Hellenic studies was completely established.

The whole literature of ancient science was of course to be found in the Greek language. All the early "nature-philosophers": Thales, Anaximenes, and Anaximander, were Ionians. Praxagoras and Anaxagoras were also of this race. And Erasistratus and Herophilus, and all the Alexandrian school, were Hellenes either by birth or by association and contact. The history of science in Rome is therefore the story of the spread of Greek thought.

Some fifty years before Galen's birth a revival of Greek studies had taken place in the Roman world. This was a renaissance which expressed itself by a desire for a more familiar acquaintance with the models of Greek classical antiquity. A name that is associated with this restoration of learning is that of Dion Chrysostom, whose chequered career is a record of unflinching devotion to a noble aspiration. The works of Hippocrates had a share in this revival, and in the time of Hadrian two editions of the Hippocratic corpus were prepared, one being undertaken by Artemidorus Capito and the other by Dioscorides.<sup>8</sup> These were regarded as standard editions, and, in spite of many defects, they fixed for the time being the Hippocratic corpus as standard works of reference in medicine.

Collateral with this revival of Greek letters and with this renewed interest in the sources of Greek medicine, there arose an interest in anatomical investigation, an interest that was symptomatic of a desire to get back to nature and to learn of things as they are. The sterile polypharmacy and the pneuma-laden physiology of the last two centuries were not enough to satisfy minds stimulated by contact with Greek sources. Quintus, a man distinguished by his zeal, resourcefulness and originality, gave lectures and attracted round him a crowd of eager students, among whom were Numesianus, Marinus, Lycus and Satyrus.<sup>9</sup> Quintus spent some time in Rome, but rousing the hatred of the vulgar mob of physicians he was expelled on a trumped-up charge from that city.<sup>10</sup> Most of his work was apparently carried on in Alexandria. He left no written memorials of what he accomplished, but his teaching was embodied in the works of Lycus and in those of Satyrus<sup>11</sup> and in the twenty books of Marinus, which Galen at a later date reduced to a compendium.<sup>12</sup> Numesianus and Marinus stand out as those who definitely made a break with the anatomy of the "ancients"<sup>13</sup>. They contributed much that was new to the fund of knowledge. The whole atmosphere of that day reminds one of the intellectual ferment that took place in the sixteenth century and of the outburst of scientific study which the revival of Greek letters then inspired. Marinus irresistibly suggests Vesalius. Galen was in the full tide of this revival. He was third in direct succession from Quintus.

<sup>8</sup> Vol. XV, p. 21.

<sup>9</sup> Vol. II, p. 217; vol. XV, p. 136.

<sup>10</sup> Vol. XIV, p. 602.

<sup>11</sup> Vol. XV, pp. 68, 136.

<sup>12</sup> Vol. XIX, p. 25.

<sup>13</sup> Vol. XV, p. 136.

Let us now glance at Galen's more immediate background and survey the influences that went to shape his character and to make him what he was. His father was apparently a man of means and substance,<sup>14</sup> who stood high in the estimation of his fellow citizens, being regarded by them "as second to none of the philosophers."<sup>15</sup> Besides a devotion to Greek literature,<sup>16</sup> he cultivated the sciences of mathematics, architecture, astronomy, geometry and agriculture.<sup>17</sup> He made some experiments on seed-testing,<sup>18</sup> a labour which won the approval of his earnest son. Between father and son there existed a bond of deep affection. The old man took charge of Galen's education till his fifteenth year.<sup>19</sup> This was carried out along the lines traditionally laid down by the Greek race, a curriculum in which the ancient classical literature played an important part. In such fostering surroundings were laid, no doubt, the foundations of that pride of race, of that conscious sense of superiority, which was always the distinguishing mark of the Hellene, and which Galen in his life displays so well. The following quotation, in which he expresses his belief in the superiority of the Greek tongue, will show how deeply Galen felt this sense of a cultural superiority.

"You would," he says, "have me learn many languages, but I feel that it is enough to know one, a language which is so essentially singular and unique, and yet so suited for the use of all, so dulcet-toned and so expressive of man's human needs. But if you wish to learn the language of barbarians, you had better clearly understand that some of these resemble the noises made by swine or frogs, or jackdaws or crows, inasmuch as they are without form or grace, and unfitted for the tongue, mouth or lips. For some of these people speak for the most part from the depths of their throats, just as if they were snoring, or they use their lips and sibilate, or they pitch the voice, or speak in a dull monotone, or they speak with gaping open mouth and roll the tongue about, or else they hardly open the mouth at all, and would seem to have tongues that are motionless and inert as if they were tied to the mouth."

"And would you then neglect the Grecian language, so very pleasant and so expressive of man's deepest feelings, a language, too, in which so much grace and beauty abound? Would you prefer to acquire your medium of expression from methods of speech that are as unsuitable as they are ugly? It were much better to learn one language, and that the most perfect of all, than to acquire six hundred debased tongues. . . . You do not wish, Sir, to learn the language of the Hellenes, well, be a barbarian if you will."<sup>20</sup>

And in another passage, where he is laying down the law about the proper care and upbringing of children, he tells us of the people for whom his remarks are intended.

"I write these instructions not for the use of the Germans, nor for any other race of savage or barbarous men, no more than I write for bears or goats or lions, or for any other wild beasts. But we address ourselves to the Greeks and to those other peoples who, although by birth barbarians, strive to emulate the manners and customs of the Hellenes."<sup>21</sup>

In his fifteenth year Galen was put to the study of philosophy. He sat first under a Stoic teacher,<sup>22</sup> then under a Platonist and next under a Peripatetic philosopher, some of whose commentaries on Aristotle still survive. He next studied under an Epicurean philosopher who had received his training at Athens, still the home of a subtle erudition.<sup>23</sup>

In his eighteenth year on his father's advice he took up the study of medicine,<sup>24</sup> and for the rest of his life, as he confesses, he followed both branches of learning with an equal enthusiasm.<sup>25</sup> It is important to stress his early training in philosophy in order to appraise the active interest which he maintained through life in these abstract studies, particularly in logic.

<sup>14</sup> Vol. X, p. 560.

<sup>15</sup> Vol. VI, p. 755.

<sup>16</sup> Vol. VIII, p. 587.

<sup>17</sup> Vol. VI, p. 755, cf. vol. V, p. 42.

<sup>18</sup> Vol. VI, p. 552, *seq.*

<sup>19</sup> Vol. XIX, p. 59.

<sup>20</sup> Vol. VIII pp. 585-7.

<sup>21</sup> Vol. VI, p. 51. Time here has brought its revenge. The text of Galen in popular and general use is the work of a German scholar, and a group of German savants in Berlin are now completing the first critical edition of his works.

<sup>22</sup> Vol. V, p. 41, *seq.*

<sup>23</sup> Vol. XVII, A, p. 614.

<sup>24</sup> Vol. X, p. 609; vol. XIX, p. 59; vol. XVI, p. 223.

<sup>25</sup> Vol. X, p. 609.

In medicine his first instructors were Satyrus and two others, Stratonicus and Aeschrion,<sup>26</sup> of whom very little is known. Satyrus<sup>27</sup> had studied under Quintus either at Alexandria or at Rome. He was an ardent anatomist and a commentator on the works of Hippocrates.<sup>28</sup> Galen next left his native city and went to Smyrna,<sup>29</sup> a pleasant town situated on the sea-board some fifty miles south of Pergamum. Here he attended the lectures of the celebrated Pelops,<sup>30</sup> a disciple of the Numesianus who had been a pupil of Quintus. Pelops, besides being a distinguished anatomist, was an ardent student of Hippocrates and the author of a book *An Introduction to the Study of Hippocrates*.<sup>31</sup> Pelops was evidently interested in experimental work as well, and Galen, under the stimulus of his teaching, composed a work *On the Movements of the Thorax and the Lung*<sup>32</sup> in addition to two or three other works of less importance. While at Smyrna he attended of his own accord the lectures of Albinus the Platonic philosopher,<sup>33</sup> one of whose treatises still survives.

We can now see that by this time the bent of Galen's genius is decided. He chooses as his teachers men like Satyrus and Pelops, anatomists and followers of Hippocrates. His devotion to Platonic philosophy also comes to the fore. This may then be regarded as the formative period of his career, in which was laid the foundation of all his achievements and in which a direction was given to his genius, from which path he never swerved. The early composition of such a work as the large treatise *On the Teaching of Hippocrates and Plato*<sup>34</sup> would also point to such a conclusion. Incidentally we may observe that the influence of this work, which is an attempt to "rationalize" Plato, must have been very profound during the period that followed. It would perhaps not be saying too much to attribute the popularity which the teaching of Plato soon came to enjoy, to the comparison which Galen instituted between the Platonic doctrines and those of Hippocrates, who was admittedly one of the wisest and sanest men who ever lived. Plotinus and Neo-Platonism are probably more closely related to the efforts of Galen than is generally acknowledged.

At the suggestion of Pelops he next proceeded to Corinth, a city which had been recently restored, where he attended the lectures of Pelops' old teacher Numesianus,<sup>35</sup> who had sat at the feet of Quintus, now probably as venerable in years as another distinguished physician, Nero's archiater<sup>36</sup> Antipater, with whom Galen at a somewhat later date was privileged to converse. Numesianus, too, was a devoted follower of Hippocrates.<sup>37</sup> To complete his studies he repaired to Alexandria,<sup>38</sup> which, in spite of its decline in material greatness, was still pre-eminent as an intellectual centre and worth frequenting, as Galen says, if for nothing else than the facilities it offered for the study of osteology.<sup>39</sup> Throughout Galen's writings there are many scattered references to his experiences at Alexandria and to the many eminent physicians, such as Julianus and Heraclianus,<sup>40</sup> with whom he came into contact there. It was evidently a school of medicine and therapeutics. But the science of physiology did not prosper. It was in bondage to the memory of the greatness of Erasistratus.

It is as well to give a brief sketch of the state of the science of medicine in Galen's day. Under the Republic and the Empire voluptuous living had given a great fillip to the study of *Materia Medica*. Another evil of those days, the constant fear of poison, had also contributed to this end.<sup>41</sup> This study had rapidly

<sup>26</sup> Vol. II, p. 225; vol. V, p. 119; vol. XII, p. 356.

<sup>27</sup> Vol. II, p. 225; vol. XVI, p. 524.

<sup>28</sup> Vol. XIX, p. 57.

<sup>29</sup> Vol. II, p. 217.

<sup>30</sup> Vol. V, p. 112; vol. VIII, p. 194.

<sup>31</sup> Vol. XVIII, B, p. 926.

<sup>32</sup> Vol. XIX, p. 17.

<sup>33</sup> Vol. II, p. 217.

<sup>34</sup> Vol. XIX, p. 5; vol. V, p. 181.

<sup>35</sup> Vol. II, p. 217.

<sup>36</sup> Vol. VIII, p. 293.

<sup>37</sup> Vol. XVI, p. 197; vol. XIX, p. 57.

<sup>38</sup> Vol. XVI, p. 136; vol. II, p. 218.

<sup>39</sup> Vol. II, p. 220.

<sup>40</sup> In the first book of the large treatise *On Methods of Healing* he makes many references to his friends at Alexandria (e.g., vol. X, p. 52, seq.).

<sup>41</sup> Vol. XIV, pp. 2, seq., 283, seq.; vol. XIII, p. 416.

degenerated into a cumbersome polypharmacy, examples of which are to be found in plenty in Galen's pages. One of the prescriptions which he transmits contains something like a hundred ingredients,<sup>42</sup> a startlingly compendious array. Incidentally, it is interesting to notice how much the placid Marcus Aurelius relied on these opium-containing compounds.<sup>42a</sup> Over against these unscientific and charlatan methods there arose the two new studies, the interest in Hippocratic medicine and the cultivation of independent anatomical investigation. A good deal of the work of the ancient writers on this latter subject had still survived, and we need only refer to the discoveries of Erasistratus and Herophilus to indicate the value of these achievements. But between the time of those whom Galen calls the "ancient" writers and the period when Quintus, Marinus and Nemesianus appeared on the scene, anatomy had stood still.<sup>43</sup> A host of anatomical works now appeared from the enthusiastic pens of Marinus, Satyrus, Lycus, Martialus and Aelianus Claudius,<sup>44</sup> Galen's immediate predecessors. It is easy enough to trace to what extent Galen was an independent discoverer and how far he relied on what these investigators had already done. We may say that he built on what they had accomplished, and we must add that he built securely and well. For although they had achieved much, many of their conclusions were obviously incomplete and others were erroneous, such as the findings of Lycus, whose voluminous work, says Galen, teemed with a multiplicity of errors.<sup>45</sup> In testing and assimilating what is of value, Galen exercised a commendable discretion. It must be said for him too that he took nothing on trust, that he subjected everything to a rigid and impartial scrutiny, and that he described nothing that he had not personally investigated.<sup>46</sup> Moreover, his technique is obviously better. The method of his preparation of animals for dissection shows a definite advance on the more casual methods of his predecessors.<sup>47</sup> For instance, he undertook the complete dissection and he removed the skin himself, an operation which had formerly been committed to attendants.<sup>48</sup> The employment of the blow-pipe, of probes, of several varieties of scalpels, and in fact an array of instruments<sup>49</sup> such as no modern dissector is possessed of, shows a care which was bound to have results more striking than those already obtained. He discovered and described for the first time such structures as the platysma myoides,<sup>49a</sup> the pterygoids,<sup>49b</sup> some of the muscles of the neck, and some of the long muscles of the spine, the popliteus,<sup>49c</sup> the lumbricals<sup>49d</sup>, the interossei<sup>49e</sup> and many of the muscles of the limbs. Several of the blood-vessels and the smaller nerves, such as the recurrent laryngeal,<sup>50</sup> were now traced and described. He recognized the lacteals, which, however, had already been observed by Erasistratus.<sup>50a</sup> His account of the structure of the brain is wonderfully comprehensive, but here he is largely indebted to the work of Herophilus.

But it is in the sphere of experimental work proper that Galen stands completely

<sup>42</sup> e.g., *vide* vol. XIV, p. 90, *seq.*

<sup>42a</sup> Vol. XIV, pp. 201, 206.

<sup>43</sup> Vol. XV, p. 136.

<sup>44</sup> Marinus wrote a work on anatomy extending to twenty volumes (XIX, p. 25; II, p. 283). The number of Satyrus' published works is not referred to (XV, p. 136). Lycus apparently wrote a good deal, principally on the muscles. One of his treatises ran into five thousand lines (XIX, p. 13). Martialus wrote two useful works (XIX, p. 13). The works of Aelianus Claudius were at a later date re-edited in a condensed form by his son (XVIIIB, p. 926). Aelianus Claudius was a native of Italy and a most prolific writer.

<sup>45</sup> Vol. II, p. 227. In an interesting statement where he is referring to the limitations of Aristotle as an anatomical investigator he compares him to those "who had spent all their lives in the study of anatomy and yet had made many mistakes, as Marinus did" (II, p. 621).

<sup>46</sup> Vol. II, pp. 648, 393; vol. IV, p. 652, *seq.*, *et passim* in *om. op.*

<sup>47</sup> Vol. II, p. 291; vol. XVIIIB, p. 928.

<sup>48</sup> Vol. XVIIIB, B, p. 929.

<sup>49</sup> References to these instruments are given in his various dissections. The best lists are those given when he is dissecting the lung and brain. (*Vide* Vol. II, 628, *seq.*; *ibid.*, p. 592, *seq.*)

<sup>49a</sup> Vol. III, p. 917.

<sup>49b</sup> Vol. II, pp. 439, 441.

<sup>49c</sup> Vol. II, p. 325.

<sup>49d</sup> Vol. II, p. 264.

<sup>49e</sup> Vol. II, p. 266.

<sup>50</sup> Vol. III, p. 578; pp. 281-8.

<sup>50a</sup> Vol. II, pp. 648, 567; vol. III, pp. 335-8.

alone. In this he far outdistances all his peers and predecessors. It would, of course, be an exaggeration to say that no experiments had been undertaken before this day: a certain amount had been attempted by Aristotle, his dealing with the heart of a tortoise, his holding fish under water, and his chopping insects, come readily to mind. Such adventures, however, were no better than the gropings of people at the dawn of the scientific age. In considering purely experimental work we may exclude surgical undertakings, such as Caesarean section,<sup>51</sup> lithotomy, the use of the catheter,<sup>52</sup> and tracheotomy,<sup>53</sup> for these operations were devoted to immediate and severely practical ends. They were not the spontaneous efforts of researchers devoted to the elucidation of the functions of structures or to the discovery of the part the several organs play in vital activities.

Some of the views current in Galen's day will show how little progress had been made, for such conclusions are manifestly incompatible with any apprehension of the value of experimental work or with any appreciation of the light it threw on the causes of disease. For example, it was still thought that the arteries on the left side of the heart were devoid of blood and that they contained only a specialized form of air. The blood-vessels were believed to have their origin in the brain, this theory was favoured by so astute a thinker as Pelops. Some held that the arteries developed into nervous structures at their endings,<sup>54</sup> others believed that the voice proceeded from the heart. The function of the kidneys as secreting organs was not comprehended, and the manner of excretion of the urine into the bladder was surrounded by the most ridiculous theories.<sup>55</sup> All the teaching about the lung and its functions stood where Erasistratus had left it,<sup>56</sup> for instance, the diaphragm was considered to be the only muscle to play an intimate part in the act of respiration. And many other beliefs, strongly held at that time, manifest at once the credulity of mankind and the extravagance into which theories may run, when uncontrolled by the sobering influence of experimental test and verification.

Galen's great achievement, therefore, is the systematic investigation he directed towards unravelling the correlation which he recognized as existing between structure and function. This task was for him the "foundation of that perfect theology which transcended all the other aspects of medicine."<sup>57</sup> It was in effect the "shining light" that led him on.<sup>58</sup>

The following account of his experimental work will show how far he succeeded.

He observed that when a longitudinal medial incision is made along the length of the cord, paralysis of the muscles does not follow, the action of the intercostals is unimpaired and the lumbar muscles and those of the lower limbs maintain their normal functions.<sup>59</sup>

Complete section of the spinal cord resulted in complete loss of sensation and of power of movement in all the muscles supplied by the nerves which sprang from the cord below the line of section.<sup>60</sup>

Hemisection of the cord resulted in paralysis only of the muscles on the side of the incision, the right lower muscle if the right side of the cord were cut, and the left lower muscles if the left half were divided.<sup>61</sup>

<sup>51</sup> "The manner of dividing the epigastrium of the pregnant woman and the way of delivering the child while it is still attached and setting it free, is not my discovery. This has been described by many others before me" (V, p. 558).

<sup>52</sup> Vol. XIV, pp. 751, 788; vol. VIII, p. 10; vol. XVII, p. 29.

<sup>53</sup> This operation was recommended by Asclepiades (XIV, p. 734).

<sup>54</sup> Vol. V, pp. 527, 544.

<sup>55</sup> Vol. II, pp. 30 seq., 57 seq.

<sup>56</sup> Vol. II, p. 660.

<sup>57</sup> Vol. IV, p. 360.

<sup>58</sup> Vol. III, p. 117.

<sup>59</sup> Vol. II, p. 684. Some of these operations were performed on large animals, but they were mostly done on small animals such as pigs a few days old (vol. II, p. 682).

<sup>60</sup> Vol. II, p. 696, seq.; vol. IV, p. 370, seq.

<sup>61</sup> Vol. VIII, p. 209.

He observes the extent of the damage suffered by the upper limb following injuries to the various cervical vertebrae,<sup>62</sup> and these conclusions are based, it would appear, more on clinical observation than on actual experiment. Injury to the fifth cervical vertebra resulted in loss of power and sensation in the hand. Injury to the sixth was followed by a partial loss, the upper part of the arm remaining unaffected. Injury to the seventh results in more pronounced disturbances, and in damage to the eighth the resulting paralysis is least extensive. Damage to the vertebrae beyond the eighth does not give rise to disturbances in the upper limb.

He showed that if the spinal cord is cut through at the first dorsal vertebra paralysis of the intercostal muscles and of all the abdominal muscles supervenes, the sphincters and the muscles of the lower limb are also put out of action. But the action of the diaphragm is unimpaired, and the respiratory function continues.

"When the spinal cord is completely severed in the upper part of the thorax, namely between the seventh and eighth cervical vertebrae, the animal drops down and lies on his side. Movements are seen only in the lower part of the thorax and this is due to pull exerted by the diaphragm."<sup>63</sup>

The latter observation is quite worthy of Galen. He then goes on to explain the action of the groups of muscles which are concerned in normal and forced respiration—these results, he states, are taken from experiments on swine and kids<sup>64</sup>—they have obviously no reference to what is seen in man.

"This muscle (the diaphragm) is used by all animals in respirations of smaller amplitude. But when the need for deeper respirations arises, such as during exertion, or in a fever, or when the heat of the surrounding atmosphere is increased, or in any other such condition, the animal is compelled to employ the intercostal muscles in addition to the diaphragm. And if any still greater need arises the upper muscles (of the neck) are put into operation as well."<sup>65</sup>

This is made clear from the following account of the operation:—

"You have observed that when the spinal cord is cut at the upper part of the thorax the animal immediately drops down and lies on his side, the voice is completely lost, the whole thorax is motionless, except the lower part of the chest, which is still undergoing movements due to the action of the diaphragm. And in order that the motion of the chest might be more clearly seen, you remember that the skin surrounding the chest was removed. All the intercostal muscles were completely out of action, the lower part of the chest was in a state of dilatation, and there was a certain amount of obscure motion in the parts higher up."<sup>66</sup>

He then alludes to the result of cutting the phrenic nerve:—

"Then I took this animal in my hands, as you remember, and cut through the nerves which supply the diaphragm, and when these were severed all motion in the lower part of the chest ceased, but the upper muscles (*the accessory muscles of the neck*) were compelled to function, and under the action of these the upper part region of the thorax was clearly seen to be dilating.

"I then took another animal, and in the neck I cut through the roots of the nerves which supply the diaphragm, and I showed how the lower part of the thorax immediately became motionless and how the intercostals became active."<sup>67</sup>

Further details are added about the part which the accessory muscles, the muscles around the scapula and the muscles of the abdominal wall play in forced and abnormal respirations, though these observations, however, can hardly be regarded as altogether satisfactory, for they contain some errors in detail.

"When the need for deeper respiration arises, the diaphragm by itself is not enough to effect this. Now if the animal breathes only with the upper muscles, movements are quite visible around the scapula, even as far as the acromion process. But if the animal is compelled to breathe only with the diaphragm, the hypochondria are raised during inspiration and contracted during expiration, no motion being effected around the scapula. When

<sup>62</sup> Vol. VII, p. 112.

<sup>63</sup> Vol. II, p. 677.

<sup>64</sup> Vol. XIV, p. 627.

<sup>65</sup> Vol. II, p. 677.

<sup>66</sup> Vol. II, p. 677.

<sup>67</sup> Vol. II, p. 678.

the intercostal muscles act alone, there is also no movement around the scapula, but the hypochondria—contrary to what happens when the diaphragm is acting alone—are contracted during inspiration and raised during expiration.”<sup>68</sup>

These observations are exceedingly interesting, not so much for what they teach as for what they display of Galen's assiduity and the thoroughness of his work.

We now come to a more detailed account of the origin of the phrenic nerve and of the experiments he performed on it.

“If you are careful you can at one stroke expose the nerves of the diaphragm. In swine there are usually three nerves (*the roots of the phrenic nerve*) on each side, in the ape there are mostly two, more rarely in the latter animal three are seen, and four are also occasionally found in swine. These nerves originate in the spinal cord of the neck, the first pair arise between the fourth and fifth vertebrae, and the second pair between the fifth and sixth, the third pair arise after the sixth vertebra, and these are very small in size. And if there is a fourth pair they arise after the seventh vertebra, and this is exceedingly fine. If all these nerves are cut the diaphragm becomes motionless.”<sup>69</sup>

The effect of various sections of the spinal cord in the neck on the activity of the phrenic nerve is summarized as follows:—

“If you cut completely through in the interval between the third and fourth vertebrae, the animal at once ceases to breathe, the chest wall and all parts of the body below the line of section becoming motionless. And it is clear that if the incision is made between the second and third vertebrae, or between the first and second, or at the base of the brain, the animal at once dies. But if the incision is made between the sixth and seventh (and it must be remembered that the section should be carried right through), all the muscles of the thorax immediately cease to function, and the animal uses only the diaphragm in breathing.”<sup>70</sup>

The mechanism of the voice was a subject which deeply interested him, and he came very near to solving it. He recognized that the voice was produced in the larynx,<sup>71</sup> and he knew that sound was the result of a vibration of the air—a marvellously penetrating observation.<sup>72</sup> In his recognition of the function of the recurrent laryngeal nerves he settled another and very practical part of the problem. He describes these nerves in detail—the term “recurrent” (*νεῦρα παλινδρομοῦτα*) is the name he applied to them. He was the first to recognize these structures and to comprehend the function which they subserved. He points out their association with the vagus trunk, nature, he adds, effects such an association for the sake of the greater strength and security of the individual nerves. The nerve on the left side, he observes, winds round the arch of the aorta, while that on the right circles round the root of the subclavian artery. He had followed the course of these nerves in all animals, but most satisfactorily in bears, dogs and cows.<sup>73</sup> The effect, which he observed, of section of one or of both these nerves, or of section of the trunk of vagus, which he here refers to as “the nerve which lies beside the arteries,” is made clear in the following quotations:—

“The paralysis which affects the larynx when the vocal nerves are cut or when they are intercepted by a ligature, is of the same kind as that which occurs in the limbs when the spinal cord is injured. I mean by the ‘vocal’ nerves those nerves which I myself discovered, for those who taught me knew only of the nerves which lie beside the arteries. Loss of the voice also occurs when these latter nerves are injured, because the special nerves of the larynx, which I have called the recurrent nerves (*νεῦρα παλινδρομοῦτα*) are part of their substance. These nerves (*those lying beside the arteries*) are distributed to several other parts, they have not the special significance which the nerves of the voice possess, for the latter belong to the organs which produce and regulate the voice. The same kind of impairment is produced in the muscles of the larynx either by damaging the recurrent nerves, or by injuring those that lie beside the arteries, for in these cases they are deprived of that power which comes from the vital principle, without which they cannot be put into activity at the command of the will.”<sup>74</sup>

<sup>68</sup> Vol. II, p. 679.

<sup>69</sup> Vol. II, p. 692; cf. vol. IV, p. 100.

<sup>70</sup> Vol. II, p. 696.

<sup>71</sup> Vol. III, p. 525, seq.; IV, p. 278.

<sup>72</sup> Vol. III, pp. 644, 522.

<sup>73</sup> Vol. IV, p. 288.

<sup>74</sup> Vol. VII, p. 53.

His researches on the respiratory organs and on the relation of these organs to voice production are therefore very interesting. His interest in such matters dates from the days he passed at Smyrna, and these experiments apparently form the basis of all his scientific researches. His demonstrations before the nobility and leading men of Rome during his first years at the Imperial capital were concerned with these questions.<sup>75</sup> Before his time, on such matters there had been very little clear or consistent thought. About the muscles of respiration there had been, too, a good deal of obscurity ; the diaphragm was considered to be the only muscle concerned in the respiratory act and its activities were believed to be limited to the inspiratory phase.<sup>76</sup> The action of the intercostals was not apprehended, and the part played by the accessory muscles, those of the scapula and the abdomen, had been totally neglected. The nervous mechanism regulating these activities remained also undiscovered.

He opens his exposition by a brief but lucid account of the structures immediately concerned with the respiratory function. "There are," he says, "twelve ribs, more rarely thirteen are found, and more rarely still eleven,"<sup>77</sup> this latter condition being so unusual that it is found in not more than one in a thousand. The sternum, although it appears to be a continuous bone, is seen on close examination to be composed of segments which correspond with the ribs with which it articulates.<sup>78</sup> It articulates with seven ribs,<sup>79</sup> the eighth rib joins the zyphoid cartilage. At the back the ribs articulate with the dorsal vertebra by a double articulation ( $\ddot{\alpha}\rho\theta\rho\omega\ \delta\iota\tau\tau\omega$ ), in the upper part with the body of the vertebra and in the lower part with the sloping transverse process.<sup>80</sup> The ribs which are not connected with the sternum are called the spurious ( $\nu\ddot{o}\theta\alpha\iota$ ) ribs. From the cartilaginous endings of the lower rib the diaphragm takes its origin, it is attached to the zyphoid cartilage in front where the line of junction is at a higher level than at the back where it is attached to the spine. At the back it is inserted to the lower vertebrae by means of two strong ligaments which in larger animals are inserted as far down as the third lumbar vertebra. A description of the intercostal muscles whose fibres overlap like the letter  $\chi$ , and the manner of their insertion, is given.<sup>81</sup> The intercostal nerves and vessels are described as being under the border of the rib, the vessels lying nearer the surface and more liable to injury during experimental operations. To deal with the emergency created by the haemorrhage resulting from the accidental wounding of the artery, he makes the useful suggestion that the injured vessel should be cut right through, the ends of the severed vessel will then retract under the overlying tissues which will press on them and so occlude the lumen.<sup>82</sup>

He showed that if the parietal pleura in any intercostal space is cut with a long incision, the lung on this side is put out of action, and the animal is therefore left with half a voice<sup>83</sup> ( $\eta\mu\acute{\iota}\phi\omega\nu$ ). If the other side of the chest is also dealt with in the same way, respiration and the voice are both completely abolished. If, in the animal so dealt with, the operator's hands are placed over the wounds at the

<sup>75</sup> This happened during the period when he was forging his way ahead in the teeth of jealousy and animosity of his professional brethren. It is interesting to recall the names of some of the illustrious personages who were present at the demonstration, which for the general interest they excited are comparable to the public demonstrations held by Vesalius, or to the experiments performed by Harvey before the court of his royal master. A gathering of distinguished men, so many of them preoccupied with the cares of office and with the many harassing duties that the uncertainty of these troubled times imposed on them, presents an imposing and impressive spectacle, and it reflects a glory and a dignity on the city whose destinies they guided. Amongst those present were Paulus, shortly to be created Praefectus Urbis, Flavius who held consular rank, Severus, at that time Consul, Sergius another public man, and Barbarus the uncle of Lucius Verus who was then absent on the ill-starred expedition to Mesopotamia. Besides these there were present representatives of the various sects and schools of thought, predominant among them being members of the Stoic and Peripatetic schools for whose especial benefit the demonstration was intended. The names of some survive—Adrian the rhetorician, Demetrius, and Alexander Damascene who was soon to take up his duties as public teacher at Athens. (Vol. XIV, p. 612, seq.)

<sup>76</sup> Vol. II, p. 657 seq.

<sup>77</sup> Vol. II, p. 652.

<sup>78</sup> Vol. II, p. 653.

<sup>79</sup> Vol. II, p. 654.

<sup>80</sup> Vol. II, p. 654; cf. *ibid.*, 606.

<sup>81</sup> Vol. II, p. 661; *ibid.* p. 502.

<sup>82</sup> Vol. II, p. 681.

<sup>83</sup> Vol. II, p. 665.

end of an attempted phase of expiration when the quantity of air in the contracting thorax is less, the animal breathes once more and recovers the use of its voice. Complete powerlessness could also be induced by cutting all the intercostal muscles, even though the parietal pleura were left intact.<sup>84</sup>

He observed too the relative effect on the thoracic movements which followed section of different sets of the intercostal muscles.<sup>85</sup> Less damage was done by cutting the muscles of the spurious ribs than by destroying those which arose from the true ribs. Little damage too was done by cutting the first intercostal muscle, somewhat more harm resulted from putting the second out of action, and then the amount of embarrassment increased as the operator worked downward, until it was found that destruction of the seventh intercostal muscle had for the animal the most markedly unhappy consequences.

Such operations show that Galen was a singularly enterprising and intrepid experimenter.

He also undertook the laborious and arduous experiment of removing the ribs below the lower angle of the scapula to show the effect on voice and respiration which such a radical operation produced. It is of interest for the careful instructions about the technique and method of procedure.<sup>86</sup>

He performed another experiment on the lung which is interesting in that it shows an appreciation of the value of quantitative measurements, which is of course the basis of all real scientific experimentation and the foundation of all success. And even though the theory which this experiment was designed to prove was in reality unsound, and unfortunately the accidents that obstruct the path of the pioneer and single-handed observer crept in to mar the effectiveness of the demonstration—the technique that it displays stands as a proof of how far Galen had advanced along the path of the experimental verification and testing of provisional conclusions. This demonstration, which may be regarded in many ways as worthy of a modern laboratory, also displays Galen as an impartial and almost disinterested observer, willing to recognize that his methods, no matter how honestly tested and tried, were yet not free from these sources of error that are inseparable from the efforts of any nascent science. This experiment was undertaken to prove that a certain amount of air is capable of passing from the lung itself into the pleural cavity, a belief which would receive a *prima facie* semblance of confirmation from the finding of a certain amount of gas in the cavity of the thorax when this was opened in the dead animal. The method of the experiment was as follows.<sup>87</sup>

A small incision was made in the skin of the thorax and to this the mouth of a bag or bladder was carefully stitched, and the juncture then smeared with some adhesive material such as wax to make it air-tight. A round-handled scalpel was then pushed through the bladder and the opening thus made in the bladder was securely tied around the handle. The point of the scalpel was then driven through the parietal pleura and so continuity was established between the intrathoracic cavity and the air in the bladder. "We can now observe," continues Galen,

"how some of the air escapes from the thorax into the bag during the phase of expiration. And you will observe that during inspiration while the chest is being expanded, this air is again drawn into the thoracic cavity through the opening in the chest, at the next expiratory movement it is again driven into the bag, and during the succeeding phase it is again drawn into the thorax. But you will observe that at each respiration more air is entering the bag and that in the end the bag is completely filled."

However, it is possible to offer two objections to the result of this experiment; one is that some air gets drawn in past the sutures, more being drawn in during expiration than what is expelled during expiration; the other source of error is that the membrane which invests the lung itself is wounded as well as the membrane which lines the thorax. For this indeed sometimes happens. It is difficult, since the lung lies close to the thoracic wall, to pierce

<sup>84</sup> Vol. II, p. 666.

<sup>85</sup> Vol. II, p. 671.

<sup>86</sup> Vol. II, p. 684 *seq.*

<sup>87</sup> Vol. II, p. 703.

through the latter without risk of penetrating the lung as well. You can see this for yourself when the lung is examined after the death of the animal. Whether the atmospheric air can get into the bladder between the ligature and the skin is the subject of a good deal of controversy, and it requires a rather lengthened argument to disprove such an objection."

In another dramatic experiment he undertook to show that loss of voice can be induced by paralysing all the intercostal nerves, and that the voice is regained when the ligatures, which are used to induce temporary loss of function in the nerves, are relaxed and the function of the intercostal muscle is restored. This arduous demonstration was carried out on a large swine (*μέγαν ὄν*), the scene of the operation being a large sunny room, "a house full of light" (*μεγτὸν αὐγῆς οἴκον*). It was an oft-repeated experiment, for he admits to having performed it several times,<sup>88</sup> publicly as well as privately, and it formed part of the demonstration which he gave in the presence of the most distinguished men in Rome.<sup>89</sup>

The experiment is described in detail, and we can follow each step of the proceedings with the utmost ease.<sup>90</sup> He points out the difficulties attendant on this operation, for instance the thick muscular investiture which lies along the vertebrae and which makes access to the nerves far from easy. He gives details about the sharpness of the hook to be employed in searching for the nerve, the kind of blunt hook that was used for exerting traction on the nerve, the curved needle carrying a ligature which was to be inserted under the nerve as near as possible to the spine so as to throw all the muscle out of action. In these operations he used a thicker kind of ligature which when moderately constricted did not damage the nerve—more slender ligatures being obviously unsuitable—and this was tied without, however, forming a blind knot (*ἄμμα τυφλὸν*) "which was rather difficult to undo." The employment of a special kind of noose rendered the demonstration easier and more effective. When all the intercostal nerves at their emergence from the spine were so secured and while the unfortunate beast was a shrieking mass of pain and horror, Galen at a given signal tightened all the ligatures, and the animal from being the seeming incarnation of clamorous and insistent protest is suddenly reduced to silence and solemn muteness. The onlookers are amazed at the spectacle, but their wonder becomes greater still when all the ligatures being simultaneously relaxed, the animal again bursts forth into a yell of howling horror. And so Galen uses the animal as a kind of living musical box, evoking shrill arpeggios and all the compass of sound at will, a pleasant discord of sweet sounds to the ear of one who regarded music not as something designed merely to please and gratify the senses but as something with a higher purpose, namely, an art that was intended to teach and inform the mind, an outlook which is typical of the Greek attitude to knowledge. In such an operation he would probably be assisted by those clever young men who had lured on the septuagenarian professor to make a public exhibition of his ignorance of anatomy and then laughed the aged man to scorn.<sup>91</sup>

A reference to some other observations and experiments which he made, will illustrate the scope and comprehensiveness of his work.

He was quite familiar with the phenomenon of the reciprocal or antagonist action of the various sets of muscle. Speaking of those of the upper limb he says:—

"Should the muscles on the outer side lose their power through a solution of continuity, the muscles on the inner side would still continue to function and the part would be flexed in consequence, since the muscles which are designed for this purpose remain unimpaired. Should the muscles on the inner side be severed, the opposite condition would follow, that is the limb would be extended and not flexed."<sup>92</sup>

He also compares the relationship of the muscles and the nerves which supply them to the action of levers, the nervous power being the force which is expended on the muscle to produce a large result in the work done.<sup>93</sup> This view somewhat anticipates the mechanical theory of muscular movements put forward by Borelli

<sup>88</sup> Vol. II, p. 690.

<sup>89</sup> Vol. XIV, p. 612.

<sup>90</sup> Vol. II, p. 667, seq.; vol. XIV, p. 628.

<sup>91</sup> Vol. II, p. 642.

<sup>92</sup> Vol. IV, p. 338, cf. *ibid.*, p. 413.

<sup>93</sup> Vol. V, pp. 208-9.

Of course, his greatest contribution to the advancement of scientific thought, and the achievement which entitled him to rank with Harvey and all the great discoverers, was his demonstration that the left ventricle and the arteries contained blood. At one stroke he swept away the age-old theory that this part of the vascular system held air or pneuma, and that only under abnormal condition could it be invaded by the blood-stream. Such a theory seems now so untenable and ridiculous that an incredulous generation is not a little inclined to deny Galen the recognition that is his due. Yet such a dogma had flourished under the authority of Erasistratus, and it had gone unchallenged under all the great anatomists of the Alexandrian school. It had woven itself into the whole system of therapeutics and medicine, and by Galen's day it was venerable with the sanction of some three hundred years.

Galen ligatured an artery in two places and slit up the intervening vessel, and in this way he showed that the artery contained blood and nothing but blood. He made this demonstration on the deep arteries, such as the thoracic aorta, as well as on the more superficial arteries like the brachial and inguinal. In this way he proved that the presence of blood was not a local limited or accidental condition. The sophistry by which such a clear and convincing demonstration was met reflects but little credit on the capacity of abstract thought to move circumspectly when separated from the logic and control of hard and troublesome facts. He plunged a scalpel into the left ventricle and showed that blood gushed out with the blood-stained instrument, and he thus endeavoured to lay at rest a theory that had almost become an established creed, for it was more than a biological tenet, it had insinuated itself into the texture and substance of all the philosophic thought of the preceding centuries, and it now rested on what seemed the unassailable foundations of men's minds and reason.

He demonstrated that the heart still continued to beat when the spinal cord was severed at the first vertebra, though every other kind of movement in the animal had ceased.<sup>94</sup> This showed that the "pulsatile force was resident in the body of the heart." Cutting the branch of the vagus which was supplied to the heart also failed to stop its rhythm, an observation which pointed to the same conclusion.

The experiments which he performed on the digestive tract are also worth quoting, though here his exposition is not always quite so clear, this obscurity being most marked when he is dealing with the oesophagus.

"If you take an animal and then expose the structures that surround the pharynx and oesophagus without cutting any of the nerves, arteries or veins that are supplied to this part, and if you then make an incision from the chin to the chest, cutting through the outer coat which has transverse fibres, and if you now offer the animal food, you will observe that he gulps it down, although the peristaltic (constricting) action is completely lost. If you take another animal and now cut through both coats with transverse incisions, you will see that this animal also gulps the food down, though the inner coat is no longer acting. From this it is clear that swallowing can take place by either coat, but not so effectively as when both coats are functioning."<sup>95</sup>

Such an experiment shows a degree of enterprise that is extraordinary, even if his hardihood is somewhat staggering and the conclusion he draws from such a feat leaves us not a little uncertain and unconvinced. He also noticed that some air is swallowed with food, an example of his faculty for close and accurate observation.<sup>96</sup>

The following observation is also eminently practical:—

"On dividing the peritoneum of a living animal, an experiment I have performed thousands of times (*μυπάύσις*), I have found all the intestines contracting peri-staltically on their contents, while the stomach on the other hand is not displaying such a simple activity, for it is observed to be embracing the contents tightly, above, below, and on every side, and further it is seen to be motionless, so that it would appear to be in intimate

<sup>94</sup> Vol. V, p. 239.

<sup>95</sup> Vol. II, p. 175.

<sup>96</sup> Vol. II, p. 176.

union with the food. During this process I always found the pylorus tightly closed and shut, just like the os uteri on the fetus."<sup>97</sup>

He also made observations on the contents of the stomach during the process of digestion.

"If you give a large soft meal to an animal, as I have often done in pigs by feeding them on some kind of mixture of flour and water, and if then at the end of about three or four hours you cut the animal open—that is if you do dissect—you will find that what he has swallowed is still in the stomach . . . When the food has undergone complete change in the stomach, the lower orifice of the stomach is opened and the food easily passes out through it from the stomach, even if it should contain a large number of pebbles, bones, grape stones, or any other body which could not undergo chylification. You may discover all this for yourself in an animal, if you happen upon the exact time when the food is in process of passing from the stomach. However, if you should fail to hit upon the right time, and the contents of the stomach are still undergoing digestion so that nothing is as yet leaving it, such an anatomical investigation will not be altogether useless. For you will notice, as I have explained a short time ago, that the pylorus is tightly closed and that the walls of the stomach are contracted on its contents in a similar manner to the way the uterus embraces the fetus."<sup>98</sup>

A subject which deeply interested Galen was the structure and function of the urinary apparatus. Lithiasis or stone in the urinary tract was at that time a very common disease, and the treatment of it called forth all the skill of the surgeon and physician. The operation for lithotomy was frequently performed, and of course it often gave rise to complications which marred the effect of an otherwise wise and successful procedure; but it was encouraging to realize that such wounds around the neck of the bladder usually healed rapidly, as Galen could observe "every day."<sup>99</sup>

He describes the blood and nerve supply to the bladder,<sup>100</sup> and noted the orbicular fibres of its muscle wall.<sup>101</sup> He drew attention to the immediate relationship that the female bladder bears to the pubic bone.<sup>102</sup> He especially noted the configuration of the male urethra, comparing it to the Roman letter "S,"<sup>103</sup> and when we remember that this letter is often found more open in older inscriptions, it does not seem a very inapt description of the curves of this passage. The urinary catheter, an instrument much in use, was made with these curves.<sup>104</sup> He dissected and described the sphincter<sup>105</sup> of the bladder, though he admits that its existence and function had been recorded before him. He was aware that during foetal life this muscle did not function, and that at this stage of the animal's life it hardly existed.<sup>106</sup> And he made the astonishing discovery—which for that day and time must be regarded as little short of marvellous—that the ureters were inserted obliquely into the bladder wall, such a provision being made by nature so that it would be impossible for the urine to get back to the kidneys, no matter how full the bladder might be. "The ureter is inserted obliquely ( $\lambda\alpha\zeta\eta$ ) into the bladder in order that nothing will pass back from the bladder to the kidney."<sup>107</sup>

The experiment which he undertook to solve the question of the function of the bladder is recorded as follows. It is not necessary to refer to the extravagant theories that such an operation was designed to confute—they are of incredible absurdity.<sup>108</sup>

"This demonstration is made in the following way. First the peritoneum over the ureters is divided, and then both ureters are ligatured; the animal is bandaged up and left alone. He will not attempt to urinate. After some little time the bandages are undone. It can now be shown that the bladder is empty, while the ureters are so full and distended as even to be on the point of bursting. Then on removing the ligatures, the bladder can be seen becoming filled with urine."

<sup>97</sup> Vol. II, p. 157.

<sup>98</sup> Vol. II, pp. 155-6.

<sup>99</sup> Vol. XVII A, p. 29.

<sup>100</sup> Vol. III, pp. 374-5; vol. II, p. 813; vol. IV, p. 326.

<sup>101</sup> Vol. III, p. 405.

<sup>102</sup> Vol. IV, p. 22.

<sup>103</sup> Vol. VIII, p. 407.

<sup>104</sup> Vol. XIV, p. 788; vol. X, p. 301.

<sup>105</sup> Vol. III, pp. 362, 405; vol. IV, pp. 238, 240.

<sup>106</sup> Vol. IV, p. 240.

<sup>107</sup> Vol. III, p. 405; cf. vol. VIII, p. 16.

<sup>108</sup> Vol. II, p. 32, *seq.*

"This having been made quite clear, the next step is to ligature the external urethra before the animal has time to micturate. And now it is found that, on pressing the bladder on all sides, the fluid which it contains does not go back through the ureters to the kidneys. By this operation it is made evident that in the living, as well as in the dead animal, the ureters are prevented from receiving back urine from the bladder."

"So much being understood, the ligature on the external urethra is removed and the animal is allowed to micturate. Next, only one of the ureters is ligatured while the other one is allowed to discharge urine into the bladder. When some time has elapsed, it can be shown that the ligatured ureter is full of fluid and that it is distended on the side next the kidney, while the other ureter which is soft and flaccid has filled the bladder with urine. Now the next step is to cut across the distended ureter and to demonstrate how the urine shoots out from it just as blood does when a vein is cut."

"Then the other ureter is cut through as well, and the animal is bandaged up with both ureters severed. When a sufficient time has gone by, the bandages are removed, and it will be found that the bladder is quite empty, while the whole abdominal cavity around the peritoneum and intestine is full of urine, just as if the animal were suffering from dropsy."<sup>109</sup>

Let us see how he dealt with the various symptoms which disease of these organs presented. The following quotation, which gives a cursory glance of his method of procedure, will make it clear that, in spite of the rather heroic treatment to which the sufferer was sometimes subjected, there is in Galen's method a good deal of sense and sound judgment :—

"Let us suppose that the patient has not passed urine for three days—do we not at once try to find out in what part of the body the cause of this symptom is situated—whether in fact it lies in the kidneys, the ureters, the bladder or in the urethra? We obviously do not look for the cause in the liver, lungs, spleen, stomach or heart, for none of these organs is concerned with micturition. If we were not aware that the separating-out of the urine takes place in the kidneys, and that it is carried by the ureters to the bladder, and that it is at last excreted from the bladder—the whole of which progress we have already treated of in our exposition *On the Natural Faculties*,<sup>110</sup> we should never be able to trace any of these causes. But merely to possess this theoretical knowledge is not enough—it were better to proceed further and enquire into the causes of the retention of urine along the lines which we have suggested. The following is the method of procedure. The physician must enquire into all the present and preceding symptoms, that is, while he is examining the present symptoms of the complaint he should enquire into what occurred before the illness came on, obtaining such information not only from the patient but also from his friends. For instance, let us suppose there is a tumour situated in the region called the pubis, that this tumour by its outline shows that the bladder is full, and let us suppose that no urine is being voided. Is it not evident in these circumstances that either the force which normally expels the urine is paralysed or that the urethral passage is blocked? Therefore we must first consider whether in reality such a paralysis can arise, bearing in mind the manner in which in the normal healthy person the excretion of urine occurs at will, that is by the cessation of the constricting action of the muscle which surrounds the neck of the bladder and by the active co-operation of the bladder itself. The action of the sphincter muscle is voluntary, while the expulsive action of the bladder is involuntary and is a 'natural' activity. It has been demonstrated in our commentary *On the Natural Faculties* that there is in almost all parts of the body an expulsive faculty which deals with superfluous matters, and that this faculty is always present, but it is only used when the particular part is irritated by these superfluities. It happens, therefore, that what is called ischuria arises when this expulsive faculty is not properly functioning. In such a condition of affairs, if you adopt the method of placing the sufferer in such a position that the neck of the bladder is vertical, and if you then press with your hands on the abnormal tumour the urine should be freely voided. If, on doing this, nothing happens, you ought no longer to suspect that the cause of the trouble is paralysis. You should rather incline to the view that the urethra is blocked. For if the muscle surrounding the urethra had been paralysed, such a condition would give rise to involuntary voiding of the urine and not to retention. We must next consider in succession the ways in which the neck

<sup>109</sup> Vol. II, pp. 36-7.

<sup>110</sup> *Vide* vol. II, pp. 1-214. This book has been translated into English by A. J. Brock, M.D. (Loeb Classical Library, 1916). It is a very happy and skilful rendering.

of the bladder called the urethra may be obstructed. In my opinion these are in all three, and they are as follows: The body itself of the bladder may be so thickened into an unnatural size that the urethral opening is compressed and blocked by the overgrowth, or some fleshy or callous body develops contrary to what is normal, or some other cause blocks the passage. The body itself of the bladder grows into a tumour of an appreciable size if it is afflicted by inflammation or fibrosis or by an abscess or by any other kind of tumour. Fleshy growths occur in the urethral passage when it is afflicted by ulceration, because another kind of substance can gradually be generated if a thick and viscid discharge continues over a long time. The meatus may be blocked by a stone, thrombus, pus or by a thick and viscid discharge. It is necessary, therefore, to distinguish between these factors, while we keep in mind the antecedent symptoms as well as those now present."

"Now, suppose it is a young boy who is the sufferer, and that there have been previous symptoms suggestive of the presence of stone, that is, the urine has been watery and has a sandy deposit, the membrum virile has been constantly irritable, and has been retracted or distended without reason, and that then the suppression of urine suddenly comes on. From such symptoms one might reasonably conjecture that a stone had dropped into the neck of the bladder. Now, place the boy on his neck and elevate the lower limbs and shake him vigorously, with the intention of causing the stone to drop back. When you have done this, tell the boy to make an effort to pass water, and if the operation has been a success and the urine flows, you will realize you have made a correct diagnosis, and that you have adopted the right method of treatment. But if the suppression still persists, shake him a second time still more vigorously, and if, in spite of this, the retention still continues, make use of the instrument called the catheter, and by means of this remove the stone from the neck of the bladder, and you will at the same time afford an exit to the urine.

"If no signs of stone have preceded the retention, but if there has been a certain amount of blood, it is very likely that it is a thrombus which is blocking the urethra. But it is quite possible that, although the bladder may be ulcerated, an actual excretion of blood may not precede the retention, and it is also quite possible that a thrombus may gradually grow. It is also quite possible that blood trickling down from the kidneys through the ureters may give rise to a thrombus. When one has such suspicions, the catheter is very useful, as also in cases where pus, or a thick and viscid discharge, is believed to block the passage. We may suspect the latter condition from a knowledge of what has preceded, for, if the kidneys or the bladder have been suffering from any disease which produces pus of such a kind, and in such large quantities that it is capable of obstructing the urethral passage, you may suspect that such a chain of circumstances has led to the suppression of urine. Or, again, if there is an abscess in any of the parts above the kidney, and if such an abscess bursts, it is quite possible that the pus may get into the kidneys.

"If, however, none of these conditions has preceded the retention of the urine, we should make inquiries into the patient's way of living, in order to discover if he leads a sedentary life, or if he uses the kind of foods that go to create thick and viscid humours. In this way we come to the conclusion that the obstruction in the neck of the bladder is a fleshy outgrowth which arises in the ulceration, and we conclude this from the preceding symptoms of ulceration, and also from the fact that the urine is voided after the passing of a catheter. I know that such an affection has arisen, at least I recognize it on passing the catheter, for the patient feels pain in that part of the passage where I had previously inferred the site of the ulcer to be, and when the catheter is passed the fleshy outgrowth is broken down by the instruments and blood and fragments of the growth are passed in the urine."<sup>111</sup>

His careful treatment of a patient who has sustained severe injuries about the perineum is worth recording.

"A man received a severe blow on the region called the perineum, and a swelling developed as the result. He was unable to pass water and the bladder was obviously full and distended as could be seen from its outline. In this case I refrained from passing a catheter because the inflammation would be aggravated by such a course of action. The better treatment was to bathe the afflicted part with warm water and to apply oil. And continuing to do this for nearly three hours, we then saw that the tension was quite relaxed, and the pain, as he himself declared, had become quite easy. Then we advised him to make an effort to pass water and while he was doing this we applied gentle pressure to the swelling

of the bladder, forcing it downwards. While this was being done the young man voided urine."<sup>112</sup>

The observation made in the following passage is of interest, for it shows that even in these riotous days people preserved a certain sense of modesty, even though its exercise was sometimes perhaps an unreasonable one.

"There is no need to speak now of the causes that bring on atony of the bladder<sup>113</sup>. These have been spoken of by me in many places while I was treating of what may happen to the simple organic tissues. But a peculiar affection is likely to befall the full bladder and we have ourselves not only witnessed this occur but we have also heard it from others. It has happened to those, who, when the bladder is full, are ashamed through feelings of modesty to leave the table and pass water, that its power is destroyed and then they can no longer urinate although they try very hard to do so."<sup>114</sup>

In conclusion, we may quote some of his experiences of nerve lesions, for his accounts of these are particularly interesting.

"A surgeon while operating for deep glandular swellings of the neck, and dividing the tissues with his fingers—he did not use a knife for fear of injuring the vessels—without realizing what he was doing tore through the recurrent nerves. As a result he rendered the patient voiceless, though the boy was cured of his glandular trouble. Another person operating on another boy in a similar way left his patient with half a voice ( $\eta\mu\lambda\phi\omega\nu$ ) as the result of injury to one of the recurrent nerves.

"These results seemed perplexing to everybody, because it was seen that although neither larynx nor the trachea was injured, the voice was profoundly affected. But when I demonstrated to them the vocal nerves they ceased to be bewildered."<sup>115</sup>

"I saw a case where the voice was so affected as to be almost completely lost. This occurred when a freezing mixture was applied to the neck during the winter. I understood what was wrong, and by the application of warming medication which soothed the nerves I restored the voice."<sup>116</sup>

"A certain person fell from a height in such a way that the upper part of the back landed heavily on the ground. On the third day his voice was feeble, and on the fourth day he was completely voiceless. At the same time he lost the use of the lower limbs while the upper limbs remained unaffected. There was no apnea or dyspnea. The whole spinal cord beneath the neck was therefore affected. The thorax was still kept in motion by the diaphragm and by the six upper muscles since these derive their nerve from the cervical spinal cord. But all the nerves supplying the intercostal muscles which produce expiration were affected. The physicians wished to act without discrimination and to direct treatment to the lower limbs because they were paralysed and to the larynx because of the loss of voice. I, however, prevented this, and I paid attention only to the part that was affected, and the inflammation of the spinal cord ceasing after the seventh day the youth regained the use of his legs and his voice returned."<sup>117</sup>

He was particularly happy about his success with Pausanias, the Syrian sophist, a well-known figure in Roman literary circles. He gives an account of the case in his work *On Exercises on Anatomy*, a product of his earlier years, and with all the enthusiastic fervour of a youthful reformer he cannot forbear a thrust at the Methodist sect, to which the physician who treated Pausanias belonged.

In this history he gives some details which are omitted from the account written later. For instance, he tells us that the patient at first experienced a sharp pain in the region of the upper thoracic vertebrae at the point where he had come into violent collision with a projecting stone, and that this pain lasted a few days and eased off about the seventh. On the fifteenth day a numbness and dysæsthesia in the fingers set in and gradually increased.

<sup>112</sup> Vol. VIII, pp. 13-14.

<sup>113</sup> Vol. VIII, p. 403.

<sup>114</sup> Vol. VII, p. 249.

<sup>115</sup> Vol. VIII, p. 55. He draws a distinction between what happens when the nerves beside the carotid arteries are cut and what occurs when the intercostal muscles are put out of action. In the former case a hoarse raucous sound is created resembling the stertorous breathing which occurs in sleep. When the intercostals cease to function all sounds cease. (Vol. II, p. 675.)

<sup>116</sup> Vol. VIII, p. 54.

<sup>117</sup> Vol. VIII, pp. 50-1.

The following quotation is taken from the work *On Local Diseases*, the product of his maturer years, and one of the most interesting and instructive of Galen's treatises. It will be noticed, too, that his judgment about his professional brethren has now, under the mellowing influence of time, become much less censorious.

"A certain man, who had been having medical applications to three fingers of the hand, remarked to me that sensation had now been lost in them for thirty days, though the power of movement was unimpaired. He said he was receiving no benefit from the drugs he had been applying to them. Taking the steps I usually do in such cases, I determined to prosecute my investigations and I summoned the physician who was attending to the fingers and enquired about the applications he was employing. When I discovered that these were suitable and proper, I set myself to investigate the reasons why the patient was receiving no benefit from them, and I accordingly questioned him about the antecedent happenings. He denied that there was any question of a preceding inflammation in the fingers or of any injury to this part from cold or from a blow. My wonder being excited, I now asked him if he had been struck on any part of the body higher up. He replied that he had not been struck on the hand, but he admitted that he had received a blow on the upper part of the back. Then I enquired how and where he had been struck. He answered, that one day on the way to Rome, he had fallen out of his car on to the ground, and that this accident happened a short time before the trouble with his fingers set in. I therefore inferred that he had acquired a schirrous (*σκιρρώδης*) affection which came on as the result of the inflammation of the part around the exit of the nerve which proceeds from the spinal cord beyond the eighth cervical vertebra. This I knew because I realized from my knowledge of anatomy that the nerves—although they appear to arise like veins<sup>118</sup> from a definitely circumscribed trunk, and you might think that each of them was a complete single unit like a vein—are in reality multiple at their immediate origin, these roots being held and bound together by a common investment which is derived from the meninges. The lower part of this nerve, which has its origin in the nerves in the neck, extends to the little fingers and it is distributed to the skin that covers these fingers, supplying half the middle finger as well."

"It certainly completely perplexed the physician that only half of this finger was affected . . . I advised that the medicine which he was applying should be omitted, and I ordered an application to the part of the spine where the origin of the trouble to the parts affected was situated."<sup>119</sup>

It is on the whole a very satisfactory clinical picture.

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<sup>118</sup> It will be remembered that the veins were held to "arise" not from the distant parts of the body but from the centre, the vena cava having its origin in the liver.

<sup>119</sup> Vol. VIII, pp. 56-8. Of. *ibid.*, p. 213.

**Two Unpublished Autograph Letters of Edward Jenner on  
the Subject of Vaccination.**

Shown by HERBERT R. SPENCER, M.D. (President).<sup>1</sup>

[It was hoped to publish the photostat copies of these letters in the *Proceedings*, but it has been found on investigation that they cannot be reproduced satisfactorily. The text is therefore printed herewith.]

Great Russel Street,  
June 30, 1806.

My dear Sir,

Your letter has been some time in my possession, and I should certainly have complied with your wishes & sent you some of Mr. Warren's persuasive little Tracts earlier<sup>2</sup> but waited for some other things of the sort, which I expected wd. have come much sooner from the Press. At length I send them to you, but trust the Smallpox has long ere this, ceased to rage among you at Henley. How wonderful that this horrid pestilence should at this time even have an existence in our Island. It must be owing chiefly to the wicked misrepresentations as Moseley, Birch & Bowley. A Physician from Copenhagen call'd on me today, and express'd his astonishment at an opposition to vaccine Inoculation, as by that means only the Smallpox was completely extinguish'd in that City. The same thing has happend in Vienna & in many wide extended districts on the Continent.

Your old Pupil Bob<sup>3</sup> is become as you may suppose a very wild Boy; but I am in hopes he will find a good Preceptor in a Mr. Bayley—a Clergyman at Gloster, to whose care I shall shortly consign him. Mrs. Jenners health still continues feeble, but I am thankful that she is still one among us. Lord H. Petty intends making a Motion on the subject of Vaccination on Wednesday next. The Papers will give it you. As a proof with what rapidity it has been adopted in some of our foreign settlements, I will mention, that my returns of Persons vaccinated at the Presidency of Madras only, during the space of three years amount to 454,579.

Believe me, dear Sir  
Yours very truly  
E. JENNER.

The Revd. Mr. Joyce,  
Henley.

(Written when dated.)

London, 14 June, 1814.

My dear Sir,

The idea of a Memorial must not be abandon'd, but at present it may be suspended. Ld. B.<sup>4</sup> is an old acquaintance of mine. Yr. Henley Fd. does not seem to be conversant with him at all. I judge only from his obversations. His Lordship is I believe a very worthy man & his present efforts in bringing forward a Bill in the House of Lords for confining within narrower limits the contagion of the Smallpox is a proof of his benevolence: but the business is conducted most wretchedly from one end of it to the other, and will soon come in contact with the foot of my Ld. Ellenboro'. This is the general opinion & shocking it is to think of it. The smallpox previously to the introduction of vaccination destroy'd annually in the British Realms directly & indirectly, about 60,000 Individuals. We see by the Bills of mortality a reduction of one half of this number in the Metropolis, that is to say, if the average of the last twenty years be taken, it will stand nearly thus—2000 deaths annually the first ten years, & 1000 deaths only the last. Now, as this vast saving of human life from the new practice, is so clear as not to admit of controversy, in that part of the Empire where population is concentrated, & where it met with the most violent opposition, I think it may fairly be calculated that the mortality is far more reduc'd in the Provinces, where it has comparatively met with far less opposition, a few districts excepted. I conceive then, that I am within bounds if I calculate the numbers which fall

<sup>1</sup> 1929, xxiii, 281 (Sect. Hist. of Med., 31).<sup>5</sup>

<sup>2</sup> "An Address from a Country Minister to his Parishioners on the Subject of the Cowpox or Vaccine Inoculation," by Thomas Alston Warren, 1803, 1804 (4th ed.).

<sup>3</sup> Jenner's second son, Robert Fitzharding Jenner.      <sup>4</sup> Lord Boringdon.

now by the stroke of S.pox to be less than 20,000—a reduction of two thirds. In the populous County of Gloster, where I have the greatest facility of making observations, the saving is at least thrice this number, But why shd. Ld. E. or any other earthly Ld. when the Lord of all has commanded us as it were to get rid of this pestilence, sanction its continuance? I have a mind to send something in this strain to the Papers to favor the passing of Ld. B.s Bill. What think you of it?

Robert is much gratified by his visit to Town. He has seen the mighty Potentates & the most brilliant illuminations that ever shone in our streets. As for myself I have not seen any of these great men & it is possible I may not as I cannot push myself into their presence, nor play the sycophant so as to crawl in.

One word respecting the Memorial. The man whom I shd. consult is *my Friend* the Marquis of Lansdown who is one of the few who took me up warmly & does not quit his hold. My own idea was, that the Ambassador of every foreign Court residing here shd. have a Copy presented to him by some great man who wd. explain its purport, previously to its being despatched to his Sovereign.

Catherine<sup>5</sup> is out on a visit, but pray give my best comps. to Mrs. Joyce and believe me truly yrs.

EDWD. JENNER.

Rev. T. Joyce,  
Henley.

<sup>5</sup> Mrs. Jenner.

## Section of Laryngology.

[May 2, 1930.]

**Post-mortem Specimen from a Case variously reported on as Granuloma, Lymphosarcoma, Endothelioma. Treated by X-rays and Radium. Death from Hæmorrhage.**—NORMAN PATTERSON, F.R.C.S.

Male, aged 24. Admitted to hospital August 30, 1928. Had been treated for six weeks for septic tonsil. *On examination:* Region of right tonsil occupied by hard swelling, which was ulcerated. In upper part of right anterior triangle there was a large freely movable swelling. Microscopic report: "Granuloma." Wassermann reaction, negative. Transferred to X-ray department for treatment. Re-admitted to aural ward September 23, 1929. Large swelling right tonsil, involving also right half of soft palate and extending to tongue and posterior pharyngeal wall, centre ulcerated. Movements of tongue restricted. Swelling on right side of neck had subsided, but large mass over left sterno-mastoid. X-ray treatment continued with some temporary improvement.

October 2, 1929.—Pathological report on a fresh piece of tissue: "Less like granuloma and more like lymphosarcoma."

October 30.—Eighteen radon needles inserted, six 4 cm., nine 3 cm., three 2 cm. 1.5 millicuries per cm.

During November 1 and 2 five needles came out spontaneously: on November 3 thirteen remaining needles removed. After this treatment there was marked oedema of palate followed by sloughing. Patient was fed mainly through an oesophageal catheter. Up to November 21 general condition seemed to improve a little, then haemorrhage occurred from right tonsillar area, controlled by manual compression. On November 28 haemorrhage returned. No bleeding point could be found. Pressure kept up by house surgeon for an hour and a half, but on removing this, bleeding recurred. I was called to the patient, and as no bleeding point could be discovered, the external carotid artery was tied. Afterwards one pint of blood was injected intravenously. Patient again improved slightly.

December 5.—Further brisk haemorrhage. Mr. Charles Donald kindly saw the case and, under great difficulty, carried out an operation on the left side of the neck. There was much scar tissue, several veins were torn, and it was practically impossible to identify structures. A vessel, which was considered to be the external carotid artery, was tied. Shortly after the operation the patient succumbed.

*Post-mortem.*—An erosion was found in the right lingual artery. A ligature was found on the right external carotid and another on the left internal carotid. The final pathological report on the tumour was "endothelioma."

*Discussion.*—The PRESIDENT said that this patient had been treated for tonsillitis and he (the speaker) had certainly, on one occasion, made the same kind of blunder. In his own case everything had pointed to quinsy, but the condition had proved to be sarcoma.

Mr. NORMAN PATTERSON, in reply, said he had not yet come to a decision as to whether radium or diathermy was the better treatment in these cases, but the pendulum was now decidedly swinging towards diathermy, which had given some brilliant results. After radium treatment a case would do well for some six weeks or months, and then there would be a recurrence, perhaps in some anomalous position.

**Naso-pharyngeal Fibroma, Removed by Diathermy; Subsequent Radium Treatment.**—E. WATSON-WILLIAMS, M.C.

Albert W. was sent to me in March, 1929, complaining of epistaxis six months previously and again recently, and obstruction of the right nostril for eighteen months. On examination I found a firm fleshy fibroma filling the right posterior choana, and

pushing down the soft palate. This was removed with Luc's forceps introduced through the nostril, and apparently the removal was complete; bleeding was brisk on grasping the tumour near the base, but ceased soon after removal. The tumour grew from the basi-sphenoid, near the choanal margin, and after removal the bone seemed to be exposed.

In March, 1930, the patient returned with symptoms worse than before, dating from Christmas, 1929. He now complained that the right side of the face had been growing larger than the left for two years, and the asymmetry was obvious, but had escaped notice on the previous occasion. Mr. R. R. Simpson, of Hull, kindly lent me his diathermy knives (shown at the last meeting), but at operation I found it was impossible to engage the base properly. I therefore covered the end of an ordinary nasal polypus snare with a drainage tube, passed the hoop of wire round the tumour, tightened it at the base, and passed the diathermy current through the snare, drawing it tight as it cut. The tumour was severed easily and bloodlessly and removed through the pharynx. Prolongations were then found to pass into the middle and inferior meatus of the nose, and a fourth lobe, previously hidden, delivered itself into the choana. These were removed piecemeal with forceps.

20 mgm. radium, with 0·5 mm. platinum screen, was inserted a fortnight later, with the object of preventing any recurrence. At that time there was no sign of any tumour tissue in the nose, inspection of which was unusually easy, owing to the expansion produced by the tumour.

#### **Microscopic Section of a Papilloma of the Vocal Cord showing an Encapsulated Foreign Body.—W. STIRK ADAMS, F.R.C.S.**

Miss W., aged 19, had no history of any laryngeal symptom before November 20, 1929. On this date she was singing in chapel and forcing a high note, when her voice suddenly went, her throat felt "funny" and she stopped singing. After the service her friends noticed that her speaking voice was husky, and it remained so until March, 1930, when I removed a single papilloma from the edge of the right vocal cord, at the junction of its anterior and middle thirds.

*Pathologist's Report.*—"There is no evidence in the sections examined such as would support the idea of a haemorrhage. Foreign body giant-cells are present in relation to hyaline material—probably a foreign body. Moreover, the nature of this material may well be mica. Silica, which is no less resistant than mica, can be seen in particulate form in sections of lungs, and the action of foreign body giant-cells is of a digestive character. Substances as resistant as silica can, in time, undergo solution in tissues, and the irritant qualities of silica are now ascribed to the action of silicic acid."—(Signed) FRANCIS W. M. LAMB, *Lecturer in Pathology, University of Birmingham.*

Patient had worked in the mica shops of the General Electric Company for eleven months before her voice went.

*Discussion.*—Dr. JOBSON HORNE said that in his opinion a foreign body was not present. The all-important point in the history of the case was the very sudden onset in the loss of the singing voice. The notes stated that there was no history of any laryngeal symptom before November 20, 1929; on that date the voice suddenly went whilst forcing a high note. Lesions sudden in onset were vascular in origin. The case apparently did not come under observation until some months later. If the larynx had been seen at the time of the accident the vocal cord would, in all probability, have presented a congested appearance—round and red like a sausage—caused by an effusion of blood. He (Dr. Jobson Horne) was of the opinion that what had been mistaken under the microscope for a foreign body was the remains of that effusion of blood, and that the fact of the patient's having worked in mica shops had no causal relationship with the condition observed in the larynx.

Mr. F. A. ROSE said he agreed with Dr. Jobson Horne that the history was of the kind usually heard when a blood-clot had formed. Apart from that, there was a difficulty in reconciling what the microscope revealed with the presence of any mineral. It was difficult

to imagine a grain of sand or a mineral substance which would submit to being cut into thin slices with the razor and appear in the serial sections. Moreover, one would expect a foreign body to be surrounded by a round-celled infiltration. This, however, lay in a space surrounded by connective tissue and elastic fibres, and, with the exception of a multi-nucleated cell at one end, there was here practically no round-celled infiltration. Another feature was the situation of the nodule, namely at that part of the cord where singers' nodules occurred, and where little blood-clots formed as a result of straining. Why should a foreign body choose such a spot to embed itself?

Mr. LIONEL COLLEDGE said he thought the so-called "foreign body" consisted of crystals formed from blood-clot.

Mr. ADAMS (in reply) said he must refer Members who had disputed the diagnosis to the pathologist's report. The possibility of a haemorrhage had been specifically put to the pathologist, by whom, not unsupported, it had consistently been negatived.

**Thyro-lingual Cyst apparently undergoing Spontaneous Destruction.**  
—DAN MCKENZIE, M.D. (President).

The patient, a clergyman, aged 40, who had resided in China for many years, had noticed a painless lump over the thyroid cartilage for six weeks.

A diffuse, flattish, firm swelling, rather soft in front, could be felt, and from its lower border a hard, string-like cord passed down in the middle line and was lost in the episternal notch. The skin over the tumour was red and adherent.

The appearance of the swelling, its recent origin, and the adhesion of the skin, raised the question of malignancy, but we finally decided that it was a thyro-lingual cyst, and removed it by operation through a mesial incision on March 28, 1930. The mass consisted of a slab of tough fibrous tissue about 3 in. by 2 in. square. In its centre was an oval cavity containing about a dram of a pus-like fluid, lost at operation.

Microscopic sections by Dr. F. H. Teale [on exhibition] surprised us by showing no trace whatever of any epithelium. The oval cavity contained granulation tissue only and cultures showed no growth.

The suggestion is that the inflammatory action was of long standing, that it had produced the hard fibrous mass and that it had destroyed and caused the absorption of the epithelial elements of a thyro-lingual cyst. The suggestion is plausible, but rather startling, as the spontaneous destruction and removal, in the body, of a congenital malformation seems not to have been hitherto recognized. Thyro-lingual cysts are, however, known to be peculiarly liable to inflammatory changes, sometimes acute.

**Ulcer in Tonsillar Region. Case for Diagnosis.—M. VLASTO, F.R.C.S.**

Male, aged 36. Seen at West London Hospital April 4, 1930. In January he had complained to his doctor of soreness on the right side of the throat. A gargle was prescribed and he completely recovered. The trouble recurred a fortnight later, and has increased up till the present. Associated with the sore throat latterly, glands have appeared on both sides of neck, chiefly on right side.

*Condition on Examination.*—A large sloughy ulcer in the right tonsillar region, involving the tonsil and the adjacent pillars of the fauces.

Considerable adenitis present on right side, also a few glands on left side. Owing to the man's age the appearance of the morbid condition, and the fact that the glands were not hard, a confident diagnosis of gumma was made. Wassermann and Kahn tests negative. Provocative Wassermann test also negative. On April 11 a piece of the morbid tissue and an enlarged gland were removed. No cough. Chest normal.

*Discussion.*—Mr. J. F. O'MALLEY asked whether the swelling had been complete in contour when Mr. Vlasto saw it, or broken down and ulcerated. It looked rather like a gumma, but he was inclined to regard it as a sarcoma or endothelioma.

Mr. R. A. WORTHINGTON said that in this kind of case, of which he had seen a few examples, he thought the best treatment was to put radium into the tonsil, and subsequently treat the glands with deep X-ray therapy.

Dr. JOBSON HORNE said he considered that the prognosis was bad, whether radium was used or not. He regarded the condition as a malignant rodent ulcer. There might occur a severe haemorrhage, and death.

Mr. T. B. LAYTON asked whether a report of Kahn negative and Wassermann negative justified the case being regarded absolutely as non-syphilitic. Also, was one to accept a negative Wassermann reaction after a provocative injection of an arsenic preparation as conclusive evidence that a case could not be syphilitic? He did not think either a negative Kahn or a negative Wassermann was absolutely conclusive, and in this case he would give iodide of potassium before anything else. If there was a malignant growth, the iodide might help the effect of deep X-ray therapy. Did Mr. Vlasto think that diathermy should be used in the case? The depth of the ulceration was such that he would be apprehensive about using diathermy to that extent. X-ray therapy seemed the preferable treatment.

Apropos of this case, he wished to correct a mistake in the *Proceedings* (1930, xxiii, Sect. Laryng. 33) where, owing to an error in typescript, he was credited with saying that 80% of tertiary syphilitic lesions did not give a positive Wassermann reaction at all. The number should be 20%.

Mr. NORMAN PATTERSON said he agreed that the ulceration in this case was too deep for diathermy, and there was much glandular involvement, which could not be dealt with surgically. Deep X-ray therapy seemed to be the only course left and, having his own case in mind, he would advise that treatment.

Mr. J. F. O'MALLEY, in further comment, said he strongly advised radium in preference to X-rays, in view of an experience he had had in the previous year in an almost identical case in which the condition had cleared up extraordinarily under radium. It was difficult to say beforehand, dogmatically, what kind of case would respond to radium treatment. The degree of malignancy of these growths differed considerably; some responded well to the treatment and some did not.

Mr. T. B. JOBSON thought that the physiological test of iodide of potassium should be tried before applying radium, in spite of the negative reactions to the Kahn and Wassermann tests.

The PRESIDENT said he thought the glands in the neck were too hard for gumma. In his opinion the condition was malignant. If so, he agreed that the lesion was too extensive for treatment by diathermy. The case seemed to be a suitable one for radium treatment.

Mr. ANDREW WYLIE said he would advise trying iodide of potassium for at least two weeks: it could do the patient any harm. The previous operation on the glands would have made them harder than they would otherwise have been.

Dr. JOBSON HORNE, in further remarks, said, with reference to treatment, he had not mentioned iodide of potassium as he had assumed that would be administered, notwithstanding the fact that the usual tests for syphilis had been negative. Iodide of potassium was a wonderful drug, and was not intended solely for the treatment of syphilis. He would commence with five-grain doses of iodide of potassium with a little quinine, and gradually increase the dose to ten, fifteen or twenty grains according to tolerance.

Mr. VLASTO (in reply) read the detailed pathological report. Reviewing the tissues as a whole, the pathologist (Dr. Elworthy) regarded the condition as a primary pharyngeal lymphosarcoma. Whilst appreciating the standpoint of those speakers who considered the morbid condition to be, clinically, a gumma (this had indeed been his own confident original diagnosis), he (Mr. Vlasto) did not agree with that diagnosis at the present time. The negative serological and flocculation tests, coupled with the fact that no improvement followed after the single dose of salvarsan, convinced him that the diagnosis lay elsewhere.

He was inclined to adopt Mr. Patterson's suggestion to treat the case by deep X-ray therapy.

*Postscript.*—The patient has now been having potassium iodide for three weeks, and several applications of deep X-ray therapy have been made. The result of this treatment is that the sloughing process has lessened, but the morbid condition has considerably extended and the glands in the neck are much more evident and harder.—[M. V.]

**Cyst of Floor of Mouth.**—DAN MCKENZIE, M.D. (President).

Child, aged 8 years. Swelling first observed six months ago, when it was half its present size. It occupies the floor of the mouth under the tongue, and is symmetrically disposed, the frenum linguae forming a gentle linear depression in its middle line. It is about the size of a bantam's egg.

The situation of the cyst in the middle line, its yellowish colour, and the age of the patient, suggest a dermoid.

What is the best way of getting the cyst out? If it can be removed from the inside I will remove it in that way.

*Discussion.*—Dr. DOUGLAS GUTHRIE said that he was showing by way of contrast with the President's case, a water-colour drawing of a cyst beneath the tongue, in a child aged two months. It consisted of a curious pointed swelling on either side of the middle line, apparently the result of obstruction in the duct of each sublingual gland. The swellings disappeared spontaneously without operation.

Mr. NORMAN PATTERSON asked whether the possibility of a thyro-glossal cyst had been considered. The contents of this swelling were fluid, unlike the condition usually met with in dermoid cysts. Again, dermoid cysts pitted on pressure. Thyro-glossal cysts appeared in the mouth, but far forward.

Mr. LESLIE POWELL thought that the cyst could be taken out through the mouth. Tracheotomy might have to be performed, though the use of intratracheal ether might obviate that procedure.

**? Tuberculoma of the Fauces.**—W. S. THACKER NEVILLE, F.R.C.S.Ed.

Patient, male, aged 27, farmer.

*On Examination.*—Whole soft palate and uvula covered with soft red tumours, resembling a mass of granulations. Posterior wall of pharynx red and polished. Both maxillary sinuses dark on transillumination, septum deviated to right so that right nostril was almost obliterated.

The uvula was removed by means of a diathermy snare and sent to a pathologist for microscopical examination. The following day a submucous resection of the septum and a double Caldwell-Luc operation were performed.

The sinuses were normal, the darkness on transillumination being due to great thickening of bone in the canine fossæ. The palate was treated by the diathermy needle. Wassermann reaction negative. The section was considered by one pathologist to show chronic inflammatory tissue alone, by another to be either syphilitic or tuberculous, whilst a third decided that it was tuberculous.

**Papilloma of Uvula.**—W. S. THACKER NEVILLE, F.R.C.S.Ed.

Male, aged 26, complains of sore throat intermittently since November, 1928, when he had diphtheria; has been off work for three months because of the discomfort in his throat.

On examination a long uvula was seen, at the end of which was a round keratinized growth. The tonsils projected slightly beyond the faecal pillars, and showed signs of chronic infection. The uvula was removed by Bordier's diathermic snare. At the same time the tonsils were removed under local anaesthesia.

Pathological report:—Simple papilloma (Sinclair Miller).

Dr. DOUGLAS GUTHRIE said he had had a case of extreme length of uvula. The patient had been resident abroad beyond the reach of medical treatment, and the uvula was so long he could hold the tip between his lips. It caused him annoyance by entering the larynx and giving rise to coughing and spasm. The basal part of that uvula had been normal in appearance, but beyond it there had been a fine strand of tissue, over 2 in. in length, and terminating in a small disc-like papilloma. The appearance recalled an illustration in Sir StClair Thomson's textbook,<sup>1</sup> except that the pedicle was much longer. Removal has been simple.

<sup>1</sup> "Diseases of the Nose and Throat, comprising Affections of the Trachea and Oesophagus," 3rd ed., London, 1926, p. 382.

**Bronchiectasis cured by Aspiration.**—W. S. THACKER NEVILLE, F.R.C.S.Ed.

As this patient came two or three weeks after a tooth had been extracted, and was coughing up pure pus, I concluded that he had aspirated a tooth. The bronchoscope showed pus coming from the left bronchus. I was unable to find a tooth. X-rays show an object looking like a foreign body, but the radiologist said it was a gland. I aspirated with a motor through a bronchoscope four or five times. Then I had the patient inverted by leaning over a high stool.

The bronchoscope removes the coagulum and allows of the free exit of pus. It is not now my practice to wash out, and in this I follow Chevalier Jackson. My patient is now quite cured.

**Discussion.**—Mr. V. E. NEGUS said he did not consider that bronchiectasis was the correct title for this case; the reports seemed to indicate a lung abscess. Even without postulating the presence of a tooth, it was easy to understand that some clot due to the extraction had entered the upper lobe bronchus and caused an abscess. Aspiration removed the septic clot which had been lying there and afterwards the lung abscess was able to drain freely. It was not correct to say that the bronchoscope did not necessarily cure the condition, because if these cases were treated by postural coughing only, they were not so likely to get well. There was much swelling, with formation of granulation tissue, and probably a septic clot was lying in the bronchus. After the septic material had been removed by bronchoscopy and small suction tubes had been passed, and after 10 per cent. silver nitrate had been applied to the granulation tissue, the patient could drain the abscess by postural coughing.

Mr. LESLIE POWELL said he had recently treated a lung abscess in this way by aspiration and no postural treatment had been carried out. The patient began to get well right away, so that evidently the improvement was due to the aspiration. He had been in the surgical wards for some time without having received benefit. He was now walking about happily.

Mr. JAMES ADAM said that in a case of lung abscess in which a clot had been inspired bronchoscopic aspiration was indicated. He had long ago given up bronchoscopic lavage which was a means of spreading pus into bronchioles previously unaffected. There was no remedy for bronchiectasis so good as systematic inversion. In his own case he induced the patient to cough once an hour, while leaning well over a high stool. By this means the quantity of pus could be reduced within a week from 15 ounces during 24 hours to 5 ounces during the same period. He had had a case—in a girl aged 13—in which many examiners had missed the diagnosis of bronchiectasis and double maxillary sinusitis. In August, 1929, he had opened both antra, and performed bronchoscopic aspiration. Afterwards inversion was carried out hourly in the patient's home. In November, 1929, no pus was present in either antrum nor was any being coughed up. There was no typical facies or clubbing of the nails. In these cases the bronchoscope was of no use unless followed by inversion treatment which enlisted nature in the promotion of a cure.

Mr. THACKER NEVILLE, in reply, agreed that aspiration was important, and that it removed the coagula of pus. In passing the bronchoscope one had to use numerous swabs to stop the cough reflex. The patient could carry out inversion three times a day.

**Laryngeal Cyst.**—R. A. WORTHINGTON, F.R.C.S.

A. S., male, aged 40. Patient has noticed his voice becoming "thick" at times during the past three months. No pain, no dyspnoea, no difficulty in swallowing. There is a pale ovoid tumour growing from the right posterior surface of the epiglottis and concealing the anterior two-thirds of the glottis. Cysts are said to be more common on the anterior surface of the epiglottis.

I propose to remove it with forceps; it can probably be pulled away by the direct method.

## Section of Obstetrics and Gynaecology.

[March 21, 1930.]

### A Case of Hydatidiform Mole with Multiple Small Syncytial Infarctions of the Lungs.

By J. ESTCOURT HUGHES, M.B., B.S.

(*Surgical Registrar, Adelaide Hospital, South Australia*).<sup>1</sup>

**Clinical Notes.**—Mrs. C., aged 24, admitted April 13, 1928, complaining of vaginal bleeding for two weeks, at first associated with extra work, but later there was a slight continual loss even when in bed. Since the previous January, the patient had considered that she was pregnant, because of amenorrhoea, morning sickness, and other symptoms of the condition. The material lost had been blood and jelly-like clots. During the four days immediately before admission, she had noted increasing weakness, and at times had felt "shivery." Throughout the course of her illness she was short of breath. For the last seven days she had also noticed that a lump, which had appeared in her abdomen, had rapidly increased. She vomited before admission. Obstetrical history normal; two children, the younger aged 9 months. Menstruation was re-established two or three months after the second confinement and was regular, occurring every twenty-eight days and lasting for five. The loss was not excessive, and the only trouble was some backache before the onset of the flow. There has been no inter-menstrual discharge. General health was usually good; no previous illnesses of importance.

**Condition on Admission.**—Temperature 98°, pulse-rate 104, respiration-rate 24. The patient was a pale young woman; pale faced; lips and cheeks rather dusky; lying quietly in bed. Breasts tender; secretion was expressed. Heart and lungs: no abnormal signs. Abdomen: a centrally placed tumour rising out of the pelvis, reaching to within 2 in. of the xiphisternum. On palpation this was smooth and regular in outline, but there were definite alterations in its tone. No foetal parts could be felt, or foetal heart sounds heard, but a uterine souffle was detected. No tenderness in the abdomen. Vaginal examination: introitus healthy; no obvious vaginal bleeding or other discharge; cervix pointing downwards and backwards; it was softened; os admitted tip of index finger. The abdominal tumour was continuous with the cervix. No internal ballottement. Fornices normal. No blood found on glove after examination. The urine revealed no abnormality.

For some hours after admission no alteration in the patient's condition was noticed, but at 7 p.m. her general condition became grave; the temperature and pulse-rate rose to 100° and 118 respectively, and toxæmia was apparent accompanied by drowsiness and poor cerebration. She was definitely cyanosed and dyspnoëic, the respiration-rate being 28. An anaesthetic was given, and the previous physical findings were confirmed. A probe was passed into the uterus, and free bleeding resulted. The general condition was causing such anxiety that no attempt was made to empty the uterus, but the cervix and vagina were swabbed with methyl-violet, and the vagina was plugged in the hope that the uterus might be stimulated to empty itself. From this time onward the patient became steadily worse, the most remarkable evidence being a rapidly deepening cyanosis and progressive dyspnoea. The mental condition also deteriorated and eventually the pulse failed and the patient died at 11 p.m.

<sup>1</sup> ACKNOWLEDGMENT.—The patient whose history is here recorded was under the care of Dr. J. Bernard Dawson (Honorary Assistant Gynaecologist) to whom I am indebted for permission to make the report.

*Post-mortem Examination.*<sup>1</sup>

On opening the abdomen the uterus was found to contain a hydatidiform mole and the right ovary a mature corpus luteum. The cervix was dilated, admitting one finger, and there were some abrasions on it and a deep cut on the anterior surface. The heart was normal and empty of blood-clot. The blood, where present in veins in the body, was fluid. The lungs were deeply congested and plum-coloured and contained little air except in small areas on their median and anterior aspects; small portions floated in water. The left lung weighed  $28\frac{1}{2}$  oz., the right  $30\frac{1}{2}$  oz. The liver was enlarged and pale. The spleen was large and congested, but not friable; it weighed  $11\frac{1}{2}$  oz. The suprarenals were normal. Microscopic examination showed a few globules of fat in the liver and no definite changes in the heart. The spleen was congested and contained a small syncytial mass, also a fibrosed patch with necrosis, probably an old tuberculous focus. Sections of the lung showed the alveoli in places partly collapsed and partly filled with red cells as in an infarction. A number of large multinucleated masses, definitely portions of fetal syncytium, were seen. Some of these were noticed jammed in small arterioles. The septa of the lungs were sometimes oedematous.

There seems no doubt that the condition in the lungs was due to multiple small syncytial infarctions leading to the escape of red cells into the alveoli and to partial collapse. So extensive were these lesions that respiratory embarrassment might have been anticipated, and it will be noted that the patient became cyanosed before death. It would seem that death must be attributed to this flooding of the pulmonary circulation with masses of foetal syncytium. It is hard to say why these were liberated to such an extent. It is known that small masses frequently become detached and can be found in the lungs.

*Comment (Dr. J. BERNARD DAWSON).*—Hydatidiform degeneration of the chorionic villi is usually accounted a rare condition, but it occurs much more frequently than is stated in the textbooks, or is apparent from the experiences of medical men in extensive obstetrical practice. The reason for this discrepancy is that it is usually only the older vesicular moles that are reported, whereas the condition is very common in the earlier months—perhaps the earlier days—of pregnancy, accounting for a considerable proportion of abortions. In the *Medical Journal of Australia* of August 18, 1928, the writer, in conjunction with Professor H. Woollard, of the University of Adelaide, reported the result of an investigation of a human ovum of eighteen days of menstrual age. It was clear from a careful study of this very early ovum that the villi were already undergoing a hydatidiform change.

In "Contributions to Embryology," issued by the Carnegie Institution of Washington (vol. xii), A. W. Meyer states that vesicular change detected in the later months of pregnancy is relatively rare, estimates ranging from 1 in 2,000 to 1 in 300 cases. On the other hand "the actual life incidence of hydatidiform degenerations in all gestations would then be 1 in 10, as based upon Pearson's—and 1 in 25 as based upon Hall's—estimated prenatal mortality."

In this same contribution Meyer further points out that this chorionic change cannot be regarded as a particularly dangerous one for the mother. The deaths reported are mainly due to subsequent chorion epithelioma. Findlay (1917) found that chorion epithelioma developed in 131 out of 500 cases collected by him. This incidence of 26% is undoubtedly too high, for, though many cases are reported because of the malignant sequel, other more fortunate cases pass unreported.

Again, such figures are based upon a study of older moles of advanced degeneration which have been retained for some time. The tendency to malignancy in these cannot be compared to that in smaller and younger specimens, many of which are aborted entire with the surrounding decidua.

The cause of death in the case reported above by Dr. Hughes is most unusual; in fact, we are unaware that any such case has previously been reported. In considering the case several facts must be borne in mind: (1) the method of implantation of the fertilized ovum in the uterus as shown by Peters, Teacher and Bryce, Mollendorf

<sup>1</sup> For this I am indebted to Professor Cleland, Honorary Pathologist, Adelaide Hospital.

and others, clearly indicates that there is a normal and extensive invasion of maternal capillaries by trophoblastic epithelium. (2) It is shown that occasional trophoblastic fragments escape into the systemic circulation even during pregnancies that are apparently normal. In 1904 Schmorl examined the lungs of 158 women who had died at different stages of pregnancy or after delivery. He found chorionic cells in the pulmonary capillaries of 80% of the bodies of these whose pregnancies had been normal. (3) Hydatidiform moles inherit this invasive property in greater or lesser degree. Some of them are apparently wholly innocent, others are capable of local invasion, others of more extensive forays upon the systemic circulation, and others, the precursors of chorion epithelioma, are frankly malignant. (4) The degree of malignancy seems to depend upon the proportion between the epithelial and the primitive mesoblastic content of the villi. The greater the epithelial content the greater the malignancy. (5) In this particular case, for some reason unknown, a hydatidiform mole of apparently innocent type suddenly and unexpectedly invaded the uterine venous system with subsequent rapid infarction of the lungs.

Dr. JAMES YOUNG said that this case reminded him of one reported to the Edinburgh Obstetrical Society some years ago by Professor James Miller, in which there had been a similar metastatic spread of the hydatidiform elements. In that instance, however, the entire chorionic villi were recognizable in the secondary lung growths.

### The Treatment of Prolapsus Uteri.

By WILLIAM FLETCHER SHAW, M.D.

WHEN a man has been brought up from youth to treat a certain condition in a certain way, when he finds that all his colleagues treat the same cases in the same way, and when he finds that almost all cases treated by himself and his colleagues are cured with very slight operative mortality, he may be pardoned for feeling a little surprised that this treatment is not universally adopted.

Thanks in a large measure to the publications of the late Professor Fothergill, this operation of colporrhaphy for prolapsus uteri has been adopted in many centres all over the world, nevertheless the fact remains that many centres still adhere to other methods of treatment, and rarely can a gynæcological journal be opened without finding an article on somebody's method of treating prolapse, supported in many instances by statistics so bad, that one wonders why they were published. For this reason I am bringing before this Society the results of this operation as practised in the Manchester school since its introduction by Professor Donald over forty years ago.

*Causation.*—It is an axiom in medicine that to select the best treatment it is necessary to discover the cause, and in the case of mechanical displacement it is necessary to go a step still further backward and discover what keeps the organ in normal position.

In the case of the female pelvic organs it was long since pointed out by anatomists that the tissue, fibrous and muscular, running from the fixed pelvic sheaths to the uterus, roughly following the uterine artery and its branches, was the main tissue which supported the uterus, while connections of this tissue running forward and backwards to the pubic arch and coccyx and, deeper still in the pelvis connected with the sphincter vaginalæ and levator ani, supported the bladder, rectum, and vagina. This is well recognized by gynæcologists to-day and I do not propose to dwell upon the anatomy. It is, however, only in recent years that this has been generally recognized, for, although certain anatomists had described this tissue, and a few gynæcologists had devised operations which depended upon this knowledge, it was, I think, Fothergill's lucidly written paper in 1908—a paper well worth re-perusal—which called wide attention to the subject. The only point upon which I am not in full agreement is the statement that this tissue surrounds the uterine artery and

its branches. It seems to me that while some of it does surround these vessels the main mass lies a little deeper in the pelvis than the artery. I am, therefore, taking it for granted that gynaecologists now accept this tissue as the main support of the female pelvic organs. If the uterus, the base of the bladder, or the rectum, is prolapsed, it means that there is weakening and stretching of this fibrous and muscular tissue, due, in the majority of cases, to trauma and strain during parturition, although in a few women there is some congenital weakness. Frequently there are superimposed secondary causes: increased abdominal pressure from tumours, chronic cough, hard work; a heavy uterus from fibroids, subinvolution, chronic cervicitis, etc., but these secondary causes would in themselves be ineffectual unless this muscle was already weakened; they are, however, frequently the determining factor where symptoms arise many years after the labour which damaged these structures.

Prolapsus uteri in virgins is a comparatively rare condition, though not so rare in the north as in the south. This does not imply that our Lancashire girls, for example, are more poorly developed than their sisters in the south, but that in the industrial north a larger number are subjected to increased intra-abdominal pressure from hard physical work.

*Symptoms.*—The one definite symptom is that "something comes down"; it may be that the cervix or a cystocele or a rectocele can be felt at the vulva, or that the whole uterus is outside in a state of complete procidentia. But although this knowledge that something is down is the most definite symptom, there are others which are just as important and are sometimes overlooked. In the early stages the patient will complain of a "bearing down feeling"; in still earlier cases her only complaint is of a chronic aching pain in the back and lower abdomen when she works or stands for long. This is a most important symptom and one which is frequently overlooked. The pelvic floor is slightly relaxed, long standing or increased intra-abdominal pressure forces down the uterus, and other tissues are dragged upon which normally would be lax. In all cases of chronic pain in the lower abdomen and back, this increased mobility of the cervix when the patient strains, should be sought for; if it is found, tightening of the pelvic muscles will cure the pain. In Manchester we operate upon large numbers of patients for this complaint of chronic pain, with the happiest results.

With marked cystocele there are often urinary symptoms, especially incontinence upon straining, while rectocele causes difficulty with defaecation.

*Treatment.*—Until comparatively recent years a woman with prolapse was condemned to wear some type of pessary for the remainder of her life, and unfortunately even now some members of our profession do not seem to have heard that this condition is curable and still persist in the use of these unsanitary inefficient contraptions. In many instances, no doubt, the doctor is influenced by the patient's fear of an operation and, finding that she is comfortable with an instrument, he leaves it at that. What he does not realize is that although the patient is comfortable now, she will not be so in a few years' time, especially after the menopause, when the pelvic muscles undergo still further atrophy. Every gynaecologist must see large numbers of patients aged over 60 or 70 years who have been condemned for years to wear one of these instruments and have now reached the stage at which life is unbearable. I operate upon a few women over 70 years of age every year and last year was twice asked to operate upon women over 80 years of age although unfortunately in each of these cases the patient was so dragged down by discomfort and general ill-health and the heart muscles were so weakened that I did not think she would stand the strain of the operation. If only the profession would realize that these conditions are curable by an operation which is almost free from risk, what an amount of suffering and discomfort would be avoided!

If we are agreed upon the cause, it would seem reasonable to assume that we should also be agreed that the correct treatment is to repair the damage to the

muscular and fibrous tissue of the pelvic floor. Unfortunately this is not so, and the number of operations devised for the cure of the condition is legion, in one textbook of operative gynaecology they are divided into thirty-five groups and each group contains several separate operations.

These operations can be divided into five classes:

- (1) Some form of hysterectomy ; (2) some form of abdominal uterine fixation ;
- (3) some form of vaginal interposition operation ; (4) Le Fort's operation ; (5) colporrhaphy.

Hysterectomy by itself is worse than useless, as anyone will testify who is called upon to treat prolapse of the pelvic floor and vaginal walls when hysterectomy has already been performed. In the few cases in which some condition of the uterus really calls for hysterectomy, this can be performed along with a colporrhaphy as is so well done by Phillips and the Sheffield school, but the colporrhaphy in these cases has to be performed with special care, to prevent a recurrence of the prolapse. Abdominal uterine fixation is, I believe, still performed by some gynaecologists, though usually in conjunction with some form of vaginal plastic operation. It seems to me illogical to do this abdominal operation unless there is some proof that this alone can cure prolapse. One of the surgeons at St. Mary's Hospital, Manchester, used to carry out ventral fixation in all cases of prolapse. His operation was a good one ; the uterus was definitely fixed to the abdominal wall, but the patients still suffered from prolapse and it made little difference to them whether the uterus came down alone or dragged the abdominal wall with it, except that the discomfort was increased because of this drag. Some years later I succeeded to his wards and for a long time was kept busy in curing these cases of prolapse in which he had performed ventral fixation. If this operation by itself is useless, I can see no logical argument for its use in conjunction with other operations. Interposition operations must only be used after the menopause, or after ensuring that the woman will remain sterile. Fraenkel [2] in a recent article advocating this method of treatment, says that "a carefully performed operation for an extensive prolapse requires for its performance ninety or more minutes." As most of the patients in these cases must be elderly women it requires no further condemnation. Le Fort's operation, if it is performed at all, must be reserved for those very rare cases which have defied all other methods of treatment. I have had no experience of it nor have any of my colleagues so far as I know. We now come to the last class, colporrhaphy, and if we agree that the primary cause is weakness or damage to the pelvic floor, it seems to be logical to treat it by tightening up the pelvic floor in the way colporrhaphy allows.

*History of Colporrhaphy.*—It is impossible to describe any one operator as "the inventor of colporrhaphy." As early as 1831 Heming operated upon the anterior vaginal wall ; he was followed by Kilian, Marion Sims, Emmett, Savage, Aveling, Morton and Gaillard, Thomas, etc., all with various modifications. Operations upon the posterior vaginal wall were performed by Hegar, Simon, Emmett, Martin, etc., and the cervix was amputated for this condition by Huguier, Gouplil, Sims, etc., but no one seems to have combined these operations or indeed attempted any operation for the cure of severe cases of prolapse (with the exception of Le Fort whose operation does not come into this category), until Donald [3] [4], of Manchester, began to do so in 1888. The 1890 edition of Hart and Barbour's "Gynaecology" contains this statement about perineorrhaphy : "These operations help, at least, by enabling the patient to wear a ring pessary," and that, apparently, was the object for which the operation was performed. At this period it was customary to use silver wire as a suture material and Donald made use of this in his first two cases in April and July, 1888. In August, 1888, he had obtained catgut and in his third case, performed on August 3, 1888, he removed a large diamond-shaped area of vaginal mucous membrane from the anterior wall and brought the raw surfaces together in "étages" by means of a continuous catgut

suture. As there was still a tendency to prolapse, an operation on the posterior wall was performed on August 17 in which the same procedure was adopted as in the anterior colporrhaphy. On August 30 the patient was discharged and to quote from the notes "the wound was healed and the outlet of the vagina only admitted two fingers with difficulty. No pessary was inserted."

During 1889-1890 Donald continued these operations and in most of the cases which were undertaken for well-marked prolapse the cervix was amputated and anterior and posterior colporrhaphy was performed. In many of these cases healing was not good and in a few there was some tendency to prolapse which necessitated the wearing of a ring pessary, but at least the operation allowed these to be retained. In March, 1891, Donald operated upon a very bad case of procidentia with a large ulcerated cervix which could not be reduced until the patient had been kept in bed for two weeks. After the operation the vagina in this case was so narrow that it was impossible to introduce a pessary. He saw the patient a year after the operation and found the uterus still in good position although no pessary was employed. In the following month he operated upon a similar case with equally good results, and in this case there was no return of the procidentia, in spite of the fact that the patient worked hard as a charwoman and was subject to chronic bronchitis.

These two cases finally established in his mind a belief in the value of the combined operation of anterior and posterior colporrhaphy and amputation of the cervix and careful suturing of the deep muscles with buried catgut sutures. For a few years after this date he combined, in a few cases, an abdominal suspension operation with the colporrhaphy but he was never satisfied that this addition was necessary and soon abandoned it. To Donald must be given the credit of devising this operation, or, at least, of combining a number of separate operations into one which was able to cure the condition of procidentia and also of being the first surgeon in this country to employ deep buried catgut sutures. Donald continued to treat all his cases of prolapse in this manner, irrespective of age or parity, and when I first became his house surgeon in 1904, every member of the staff of St. Mary's Hospital had followed his lead and for some years I saw no case of prolapsus uteri treated in any other way. Many years later Fothergill [1] called attention to the anatomy of the pelvis and stressed the importance of the parametrium as the supporting structure of the uterus and the paracolpos of the vagina; he showed that it was only when this tissue was stretched or torn that the uterus or vaginal walls could prolapse and that the rational treatment for the condition was repair, shortening and strengthening of these structures. Later he [4] [5] modified Donald's operation by using a triangular incision for the anterior colporrhaphy, with the base near the cervix, and by amputation of the cervix with a circular incision around the posterior surface to join the angles at the base of this triangle. These modifications were modifications of technique only and made the suturing of the parametrium somewhat easier, but the general principle was the same as in Donald's operation. Fothergill wrote several papers upon this operation and did great service in bringing the method and its results before the gynaecological world and there is little doubt that the spread of the operation over the Empire is largely due to his writings. Having exposed the parametrium, Fothergill relied upon the sutures through the vaginal mucosa to shorten this tissue, but it always seemed to me that this could be attained with more certainty if the parametrium was sutured separately and I have always inserted separate sutures into this tissue since I adopted Fothergill's incisions for the anterior colporrhaphy.

*Technique of operation.*--The method of colporrhaphy which I now describe and illustrate is the one which I myself follow, but I must emphasize the point that this is no new operation. In its general principles it is the operation I learnt many years ago under Professor Donald, modified in some of its details by Fothergill and

in others by myself. The patient is placed on the table in the lithotomy position; the vulva is shaved and this and the vagina are washed with soap and water, and then swabbed with surgical spirit and finally with iodine solution. Next the labia minora are stitched outwards, the cervix is grasped with a vulsellum and the parts are again swabbed and flushed with spirit. I think the shortest and clearest description will be to follow the illustrations and emphasize any special point.

Fig. 1 shows the method of stitching the labia minora out of the way. The operation area is covered by a sterile towel with an oval opening. The dark line shows its edge. A catgut stitch is inserted through the towel into the patient's skin and then through the labium minus: when this is tied the labium is drawn out, well away from the line of vision and it now presents a smooth surface which is more easily sterilized. The illustration shows the left labium stretched out and the right lying in the normal position, while the succeeding illustrations show both stretched out. These stitches are removed at the end of the operation. I have found this much more satisfactory than any of the instruments devised for this purpose.

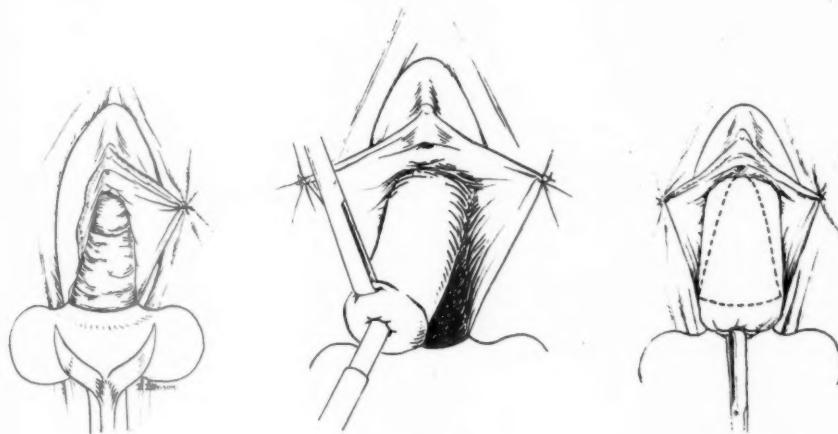


FIG. 1.

FIG. 2.

FIG. 3.

Fig. 2.—As the cervix will be cut across at a later stage of the operation and the edge of the vaginal incision sutured to the edge of the cervical canal, it is necessary to have this canal well dilated. The best method of doing this is with the Clifford-Walls' dilators, after which the uterus should be curedtted. This is not a necessary part of the operation but it only takes a few minutes and sometimes leads to the discovery of unexpected trouble.

Fig. 3.—The cervix, grasped with a vulsellum, is pulled down as far as possible by an assistant. A triangular area is then marked off by a scalpel, the base near the cervix, the apex near the urethra. It is impossible to give measurements for this, as every case differs, but the base must be wide and of about the same proportion as in the illustration.

Fig. 4 (p. 40) shows the method of dissecting away the whole thickness of the vaginal mucosa from this triangular area. If the case is one of procidentia, with the anterior vaginal wall pulled out smooth, it does not matter whether the dissection commences at the apex or the base, but when, as in the majority of cases, the cervix only comes to or just beyond the vulva and the anterior wall is still fixed a little above the urethral opening, one or more folds in the vaginal wall are inevitable and it is very difficult to dissect these from above, whereas if the dissection commences from the cervix the deep tissue fixing the vaginal mucosa is incised and the mucosa unfolds.

Fig. 5 shows the parts after removal of this triangular piece of vaginal wall. B is the bladder, and C the vaginal muscle fibres fixing the bladder to the cervix. The dotted line shows the line of incision through the tissue.

Fig. 6.—The bladder is grasped with the finger and thumb of the left hand and the few muscle fibres fixing it down to the cervix are snipped through with scissors. This allows the bladder easily to be pushed up, the cervix exposed, and also the thick muscular band at the base of the broad ligament which attaches the cervix to the pelvis. This sketch shows the cervix with the insertion of the thick band of muscular and connective tissue at the base of the broad ligament. The bladder has been pushed away from the cervix.

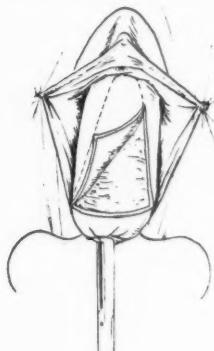


FIG. 4.

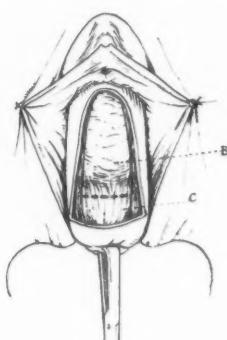


FIG. 5.



FIG. 6.



FIG. 7.



FIG. 8.

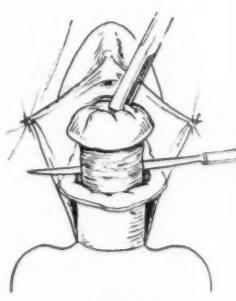


FIG. 9.

Fig. 7 shows the sutures passed through this strong band on each side. These are left untied until after the amputation of the cervix, but it is convenient to insert them at this stage. When these sutures are tied this tissue from each side is drawn forward in front of the cervix and united with a similar tuck from the opposite side. In this way this tissue on both sides is folded and so shortened and strengthened. This I believe to be the most important step in the operation.

Fig. 8.—The cervix should now be amputated. The vulsellum grasping it brings it forward as far as possible and an incision is made from one angle of the anterior triangle, round the posterior surface of the cervix, to the other angle at the base of the anterior triangle. The vaginal wall is now dissected from the cervix for a variable distance, depending upon the amount of cervix which it is decided to amputate.

Fig. 9 shows the flap of vaginal tissue dissected from the cervix and the method of amputation of this organ.

Fig. 10 shows the tissues after amputation of the cervix, before any sutures are inserted. (a) is the angle at the base of the anterior triangle; (b) is the edge of vaginal tissue dissected from the cervix; (c) the cut end of the cervix; (d) the bladder.

Fig. 11 shows the method of suturing the cut edge of the vaginal wall to the cervix. The sutures commence at the middle of the incision in the posterior wall and are continued along each side. Finally, the angles at the base of the anterior triangle are drawn together in the centre of the anterior wall of the cervix. The best way to do this is to pass the suture through the flap at one angle, then through the cervix, and finally through the flap at the other angle. This is shown by "A," but note that this is not the suture shown in the needle, which is an intermediate suture. Some operators suture the cervix with a continuous suture, but I am afraid to trust to this in this situation and employ separate sutures.

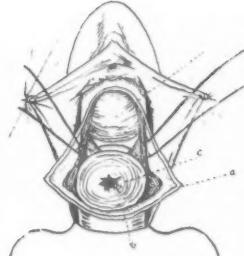


FIG. 10.

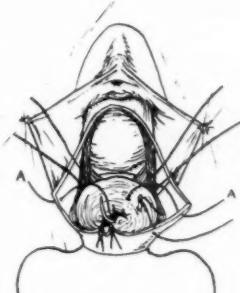


FIG. 11.

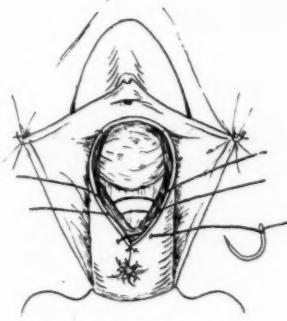


FIG. 12.

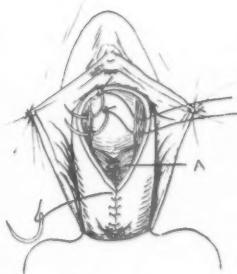


FIG. 13.

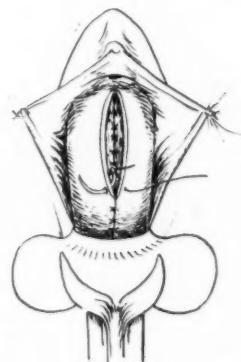


FIG. 14.

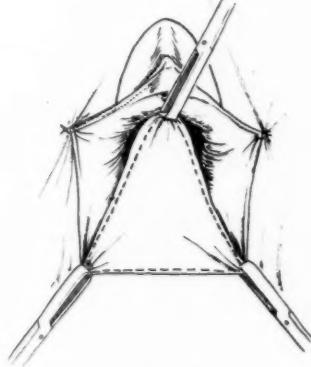


FIG. 15.

Fig. 12 shows the cervix sutured and the commencement of the closure of the anterior incision. This is best done by a continuous suture for four or five stitches. When these are inserted the cervix will slip up into the vagina and should not be seen again. The two deep sutures inserted in fig. 7 are still untied.

Fig. 13.—If the uterus is retroflexed it should now be replaced and the two deep sutures tied as is shown in "A." This should permanently anchor the cervix in the centre of the pelvis and it usually suffices to keep the uterus anteflexed.

If a long suture has been left in the cervix, it can be proved, by pulling on this, how well the cervix is suspended. Deep sutures are now inserted into the vaginal muscle and the muscle at the base of the bladder. When these are tied the bladder disappears and the hernia is closed.

Fig 14.—The closure of the anterior wall is now completed by a continuous suture.

Fig. 15 (p. 40).—*Posterior colpo-perineorrhaphy.*—The loose tissue of the posterior wall is grasped by a pair of forceps. This position requires some judgment: if it is too high the upper part of the vagina will be too constricted, if too low the upper part will have redundant tissue, which will afterwards sag over the lower constricted area and give the patient a feel of "something coming down." This illustration shows the perineum grasped by two pairs of forceps, so as to make with the first pair a triangle with the base on the perineum. In practice it is easier to grasp the mucosa on each side, half way between the apex and the base. This upper triangle is dissected and the sides are drawn together with a continuous catgut suture, and then the incision is continued on each side to the perineum, when the remaining portion of the triangle can be removed. This is a detail of operative technique which is difficult to show in a diagram.

Fig. 16.—The rectum is adherent to the posterior vaginal wall and must be separated by grasping it with the left thumb and fingers and, after snipping through the few retaining muscle fibres, it can easily be stripped away from the vaginal wall.

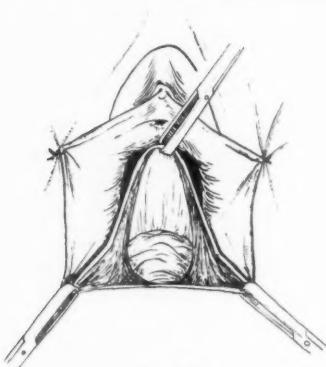


FIG. 16.

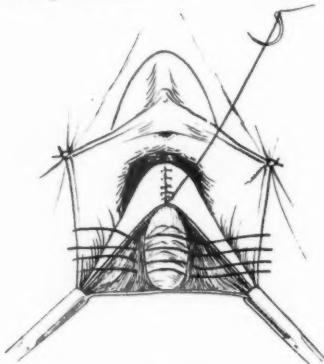


FIG. 17.

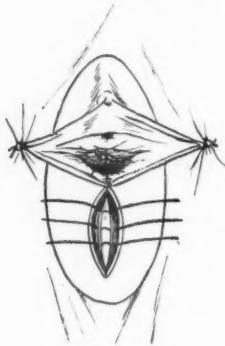


FIG. 18.

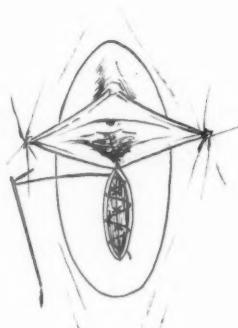


FIG. 19.



FIG. 20.

This diagram shows the rectum separated from the vaginal wall and the muscles of the pelvic floor, vagina and perineum widely separated. The most important part of the operation is the suturing of these muscles, and it is possible at this stage to suture the important part of the pelvic floor which runs backward along the base of the utero-sacral ligaments from the cervix to the coccyx.

Fig. 17.—These deep sutures are shown in this diagram, although there should have been two or three at a higher level than those shown. The method of closing the vaginal incision by means of a continuous suture is also shown.

Fig. 18 shows the vaginal incision closed and the incision of another layer of deep sutures into the muscle. There are usually three layers of these, the middle one suturing the levators ani.

No. 19 shows the closure of the perineal incision by means of a subcuticular suture. The labia minora are still sutured outside.

Fig. 20 shows the completed operation. The labia minora have been freed. The line of the perineal suture is shown and the line of the suture in the anterior vaginal wall indicated.

*Results.*—The risks from this operation are very slight. For twenty-three years I have been performing it, and in my hospital and private records I can find only eight deaths. In four of these the cause of death is not recorded in the notes; in one, death was due to pneumonia; in one to heart failure; in one, to septic absorption from a piece of gauze retained in the uterus due to the snapping of the gauze ribbon when the medical attendant removed it the day after the operation; in the last, to pyelitis caused by operating too soon after an attack of cystitis. These eight deaths occurred in 1,828 patients operated upon, which gives an operative mortality of 0·43%.

To obtain an accurate record of results it is necessary to allow a few years to elapse between the operation and the date of the inquiry, as it takes some time for a prolapse to recur. In the figures I quote this period has varied from three to seven years. This delay greatly increases the difficulty of obtaining large numbers of replies, especially amongst hospital patients, as so many of them have left their old addresses, and many do not trouble to reply even to a second or third circular, and if application is made to their doctor it is frequently found that he has lost trace of them.

In Manchester we are all performing the same operation: no doubt each operator has modified some minor details, but the general method is the same, so that it will not be necessary for me to give a larger series of cases than will prove that my results conform with those already published from my hospital.

In 1921, the late W. E. Fothergill published the results obtained in 156 cases. These showed 97% free from recurrence, and in two of the four in which there had been recurrence two patients had had children since the operation. At the same meeting my colleague, Dr. F. H. Lacey, reported the results obtained in 521 cases operated upon by all members of the staff. Of these 87% of the patients reported that they were cured, but this percentage is really much too low, as a large number of those whose replies were unsatisfactory failed to come for further examination and so were included as failures, whereas of those who did come for examination a large percentage had no prolapse and were complaining of symptoms unconnected with this condition. In many other cases there were special reasons for the recurrence, so that the correct percentage of non-recurrence was much higher than 87%. For the purpose of this paper I sent a questionnaire to a large number of consecutive patients who had been operated upon from three to seven years before that date. I have been able to obtain 293 replies with the following results: non-recurrence 282 (96·2%); recurrence 11 (3·7%). To devise a questionnaire which is fool-proof seems to be impossible. A number of patients returned unsatisfactory replies, and I endeavoured to re-examine all who did not state definitely that they were cured and had had no return of the "bearing down." In most of the cases which I re-examined, the patients were cured of the prolapse, but had failed to give a satisfactory reply about their present condition because they were now suffering from some other disablement totally unconnected with the original trouble. In spite of many efforts on my part, four patients who have sent unsatisfactory replies have not been interviewed and I am including these among the failures, though I am doubtful if any of them have any recurrence.

Of thirteen patients with recurrence, five have had children since the operation. The recurrences were due to the recurrence of the damage which produced the original prolapse, and so can hardly be regarded as operative failures. If we eliminate those with subsequent confinement, the real incidence of recurrence is 2·1%. If I

could re-examine the four who have sent unsatisfactory replies, the percentage of recurrence would be negligible.

These figures are proof that for ordinary cases of prolapse it is almost possible to give a guarantee of cure. There are, however, certain special features which require further examination.

What is the effect of subsequent childbirth? One of the arguments against this operation is that the scar tissue about the cervix will cause delay in the first stage of labour. This we do not find to be the case amongst the patients admitted to hospital, admittedly a small number, nor do we hear of complaints on this score from doctors, and I feel sure that we should do so if there was any trouble.

What is of more importance is the patient's query: "Will the prolapse recur if I have more children?" It is very difficult to get a large series of cases after subsequent labour as so many of these operations are performed after the child-bearing age, or at least after the period when the patient is determined there shall be no further increase in the family.

In this series there are only eighteen patients who have had children subsequent to the operation, with the following records: non-recurrence 13 (72.2%); recurrence 5 (27.8%).

These are very small figures, but they are sufficient to show that a large percentage do not have recurrence and that subsequent confinement holds no special terrors. It is necessary, however, to emphasize the basic truth of all good midwifery, i.e., to give plenty of time to the first stage and on no account to attempt delivery until the cervix is fully dilated.

*Results after the menopause.*—The ideal age at which to perform the operation is about that of the menopause, while the patient's tissues are sufficiently young to heal well, but when the floor of the pelvis is not likely to be called upon to bear the strain of a labour.

After the menopause the pelvic muscles undergo atrophy, and in many patients a slight prolapse which has called forth few symptoms steadily progresses as time proceeds, and so we see many patients over 50, 60, 70 and even over 80 years of age, who have remained fairly comfortable, many by wearing some instrument, until the atrophy has reached such a stage that no instrument can be retained and the patient is in a state of misery.

It is especially for patients after the menopause that the "interposition operation" is performed, and in these cases there is no strong argument against it except that it takes longer and that the results are not so good as those of the operation we perform in Manchester.

In this series there were 79 patients over 50 years of age, and the results were as follows: No recurrence 77 (97.5%); recurrence 2 (2.5%).

Even the two recurrences were only very slight; the patients are much better than they were before the operation, and it is doubtful if it is worth while to do anything further. In one there is a little laxity of the upper posterior vaginal wall which hangs down over the post-colporrhaphy incision, and in the other there is slight cystocele with a return of incontinence of urine on straining.

In this series there were three patients aged respectively 71, 73 and 75 years, all of whom are quite cured.

*Prolapse in nulliparæ.*—The commonest cause of prolapse is weakening of the pelvic floor during parturition, but a small percentage of cases occur in women who have not had children, some of whom are undoubtedly virgines intactæ. In these cases there is a weakness of the pelvic floor, and if the patients undergo heavy physical strain, with increased intra-abdominal pressure, the uterus may be driven down. This, as I have indicated, probably accounts for the larger number of these cases we see in the industrial North as compared with the more leisured South. In this series I have been particularly unlucky, as I have only obtained replies from four-

teen patients, of whom thirteen were completely cured, while one had some recurrence : one of these was a virgin aged 16, and two were virgins aged 63. I have not tabulated these figures or reduced them to percentages, as they are too small, but they are an indication of our belief that the best treatment for these cases is anterior and posterior colporrhaphy with amputation of the cervix if it is hypertrophied, as is usually the case.

*Post-operative treatment and complications.*—For success it is essential to eliminate meddlesome nursing, and it is a demonstrable fact that these cases do best in institutions where the staff is commonly nursing this type, owing, in large measure, to their training to "leave well alone."

The perineum should be kept as dry as possible ; after each action of the bladder and bowels it should be swabbed with a small quantity of lotion, dried with spirit and re-covered with a sterile pad. After the operation we pack dry sterile gauze into the vagina to prevent oozing, and this is easily removed the following day. In one hospital I now use B.I.P. on the gauze to prevent it adhering to and damaging the vaginal mucosa. On the fifth day I give one vaginal douche of boracic lotion to wash away any blood-clot which may have accumulated in the vagina.

*Retention of urine.*—This is a common complication, in fact the majority of patients require a catheter during the night after the operation, owing to the pressure of the gauze. On the following morning the gauze is removed and the patient encouraged to pass urine herself. In a large number of cases the catheter will still be required for two or three days, though every endeavour must be made to encourage her to perform the act herself. Even with the greatest care there is risk of infection and a mild chronic cystitis sometimes follows, though, in most cases, this readily yields to medicinal treatment.

*Hæmorrhage about one week after operation.*—This is the greatest trouble we have to contend with, but fortunately, with due care, cases of serious moment are very rare. I think this hæmorrhage comes from the cervix and is due to a mild sepsis which prevents cervical healing and so, when the catgut sutures give way, the cervical incision gapes and bleeds. It is rare for the hæmorrhage to commence suddenly ; much more frequently there is a little bright red stain on the pad which should act as a warning. If a mild antiseptic douche is then given to wash away septic blood-clots and an iodox pessary inserted, this treatment being repeated on the following three or four days, there will rarely be any further trouble. If the hæmorrhage is more severe, it will be necessary to pack some gauze into the vagina, and the upper part of this, which is to be applied to the cervix, should be soaked in spirit. It will rarely be necessary to give an anaesthetic in order to re-stitch the incisions and I can only remember having to do this on two occasions. I believe the trouble frequently originates in a small blood-clot formed from cervical oozing, which becomes infected in the vagina and, lying in contact with the cervix, infects the cervical incision. To obviate this, I have recently returned to Professor Donald's old treatment of giving a mild antiseptic douche on the fifth day.

*Occlusion of the cervix.*—When Fothergill first suggested circular amputation of the cervix, it was argued against it that there would frequently be adhesions of the circular incision and the cervical canal would be occluded. Provided the cervix is well dilated, this very rarely occurs. I have used this particular method of amputation for many years and only on one occasion have I encountered this complication. In that case it was definitely due to slight adhesions with occlusion of the canal and the result of treatment was dramatic. On four monthly intervals the patient had severe abdominal pain, but complete amenorrhœa. On the fourth occasion I was called out to see her and, against all the rules of good gynaecology, but with strict antiseptic precautions, I passed a uterine sound. The cervical adhesions were very soft and were well inside the cervix ; they presented little resistance to the sound, which passed into a dilated uterus, whose walls were not

readily felt; the passage was followed by such a large gush of blood that for a moment I feared I had opened some important blood-vessel.

*Vaginal adhesions.*—As the incisions in the anterior and posterior vaginal walls lie in apposition, it is not surprising that they sometimes adhere. It is only in a small percentage of cases that this occurs and the only trouble is dyspareunia. If the patient is an elderly widow I do not touch these adhesions, but if she is married it is usually possible to stretch them digitally or even separate the adhesions without much hemorrhage. I do not think I have given an anaesthetic and tied these adhesions after separation on more than one or two occasions.

*Lax posterior vaginal wall.*—If the incision in the posterior wall is not commenced sufficiently high, the posterior fornix will remain patulous and the patient may return complaining of "bearing down," when in reality it is simply that a piece of redundant wall in the posterior fornix has prolapsed over the posterior incision. It is only in a very small number of cases that this occurs, but it is a definite type of failure always to be kept in mind. In this series there is one patient who has this type of recurrence.

*Ulcerated cervix.*—I have put this amongst the complications—though it is really a pre-operative complication—as I wish to call special attention to it. It is possible to cure any ulcer in three weeks or less if the patient will remain in bed, replace the procidentia whenever it comes down, and douche twice daily, once with boracic acid and once with alum lotion. To operate in the presence of an ulcer is to court disaster, as these ulcers are generally septic and a breaking down of the wound is one of the least troubles which may follow. When the ulcer is healed the operation can be undertaken in complete safety. This operation of anterior and posterior colporrhaphy with amputation of the cervix, first used in the cure of prolapsus uteri by Professor Donald and since then by Fothergill and almost every other Manchester gynaecologist, but still retaining the main principles laid down by Donald, has been in constant use in the Manchester school since 1888 for the treatment of prolapsus uteri in women of all classes and of all ages. It is an operation with a very low mortality, and with few post-operative complications, and it will cure almost every case.

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### The Effect of Hysteropexy upon a Subsequent Pregnancy, and of Pregnancy upon a Previous Hysteropexy.

By ARTHUR E. GILES, M.D., F.R.C.S. (President).

THE treatment of uterine displacements by suture of the uterus to the abdominal wall has enthusiastic supporters and implacable opponents. It is a striking fact that with rare exceptions the two groups are synonymous with those who have tried it and those who have not.

Its advocates claim that it is a simple and safe operation applicable both to prolapse and to retroversion, and that failures, in the sense of a later return of the displacement, are rare.

Its opponents do not deny that it is simple and safe, nor do they question its permanent good results. Their chief—and often their only—objection is comprised in the assertion that the operation causes grave complications in the event of a

subsequent pregnancy, and is therefore an unjustifiable procedure in the treatment of women of child-bearing age. As long ago as 1910,<sup>1</sup> I reported the after-results of abdominal operations. The series included 311 cases of hysteropexy, among which were a number of patients who had full-time confinements subsequently. As the result of very full reports and inquiry, I felt justified in arriving at the conclusion that hysteropexy causes no complications during labour. What I must call the mistaken idea of the danger of hysteropexy to a subsequent pregnancy, is still widely prevalent, and I have therefore felt that it was not only advisable but necessary that I should present the case anew, supplementing the earlier material with the results of all the later cases that I have been able to trace up to date.

A few preliminary words about hysteropexy are necessitated by the fact that among those who decry it there is a profound misconception as to the way in which the operation is performed. The misconception is partly the result of the unfortunate habit of using the term "ventrofixation of the uterus." Ventrofixation, when first introduced, was a procedure in which the uterus was brought up to the abdominal wall in an anteflexed position, and the sutures were passed through the posterior surface of the uterus and through the muscle and fascia on either side of the incision. Naturally a patient on whom this operation was done was predestined to disaster in the event of a subsequent pregnancy. As far as permanence was concerned, the results were good. At the same time another operation was introduced, called "ventro-suspension." Here, the sutures were passed through the anterior surface of the uterus, and through peritoneum only, on either side of the incision. Such an operation did not militate against pregnancy, but naturally the results, as regards permanence, were very bad.

In order to avoid confusion I have long advocated the abandonment of the clumsy and misleading terms "ventrofixation" and "ventrosuspension" and urged the exclusive use of the term "hysteropexy." The correct way in which to perform hysteropexy is to pass three sutures of stout silk (catgut does not last long enough) through the anterior surface of the uterus, as low down and as near to the bladder-reflection as possible, and on either side the sutures are passed through fascia, muscle and peritoneum. The attachment to the fascia secures permanence; and the low position of the sutures ensures that the body of the uterus is left free to expand in the event of pregnancy, so that no complication results. The fixation of the lower part of the uterus has even a positively beneficial effect during labour, as it lessens the chance of the obstructive descent of the anterior lip of the uterus in front of the advancing head. It is not unfair to insist that when the effects of hysteropexy on pregnancy are discussed, it should be assumed and understood that the operation is done in the way that I have described, and that hysteropexy should not be blamed for the bad results of a faultily performed operation.

The published series comprised 311 cases operated upon up to June, 1909. In the last twenty years there have been 1,113 cases of hysteropexy, making a total of 1,424, divided as follows:—

TABLE I.—ANALYSIS OF CASES OF HYSTEROPEXY.

		1st series	2nd series	Total
Married women, aged 40 and under	...	190	575	765
Married women, aged over 40	...	72	385	457
Unmarried women and widows	...	49	153	202
		311	1,113	1,424

Only the married women, aged 40 and under, concern us here. Included among them are a few cases of single women who married and had children subsequent to the operation. A considerable number of the patients could not be traced, especially

<sup>1</sup> "After-results of Abdominal Operations on the Pelvic Organs, Based on a Series of 1,000 Consecutive Cases," *Journ. Obst. and Gyn. Brit. Emp.*, 1910, xvii, 153, 257, 365, 461. Published in book-form with the same title : Baillière, Tindall and Cox, 1910.

in the later series in which the cases were not kept in touch with assiduously, as they were in the first series. Among those who were traced, 107 became pregnant and between them they had 139 pregnancies. These terminated as follows in the two series:—

TABLE II.—SUMMARY OF CASES OF PREGNANCY AFTER HYSTEROPEXY.

		1st series	2nd series	Total
Number pregnant	...	48	59	107
Number of pregnancies	...	64	75	139
Full-time deliveries	...	44	66	110
Miscarriages	...	16	8	24
Pregnant when last seen, but result unknown	...	4	1	5

The particulars of the pregnancies in the first series have already been published and those in the present series are given in the following table:—

TABLE III.—PARTICULARS OF CASES OF PREGNANCY AFTER HYSTEROPEXY. 2ND SERIES.

No.	Name and Age	Date of Operation and Doctor	Particulars of Pregnancies	Position of Uterus
1	V. D. 35	Nov. 16, 1909 Dr. R. Murray Leslie	Confinement. Girl, May 4, 1911 "Confinement was rapid." (Patient's report)	Good, July, 1911 (A. E. G.)
2	V. H. 30	Dec. 3, 1909 Dr. Shaw	Confinement. 1912. Two children before operation. "None of the confinements were normal, forceps and chloroform at last one." (Patient's report)	Good, June, 1920 (A. E. G.)
3	F. B. 28	April 3, 1916 Dr. Distin	Confinement. Girl, July, 1912 ,, Girl, Dec., 1914 ,, Boy, March, 1917 Forceps with all three; she thinks she could have done without, if left longer. (Patient's report)	Good, February, 1919 (A. E. G.)
4	E. C. 33	Dec. 19, 1910 Dr. G. Phillips	Confinement, Dec., 1912. Induction at 8 months as pelvis was small; child died at birth. (Patient's report)	Good, September, 1913 (A. E. G.)
5	M. W. 24	Jan. 12, 1911 Dr. A. G. Dutton	Confinement. Boy, March, 1912. Normal breech. Confinement. Girl, June, 1917. Normal (P.R.)	Good, February, 1925 (A. E. G.)
6	E. B. 29	Feb. 6, 1912 Dr. E. C. Curtis	Confinement. Boy, March, 1914. Normal (P.R.)	"Uterus appears closely attached to abdominal wall," February, 1918 (A. E. G.)
7	E. L. 32	May 18, 1911	Confinement. Girl, Jan., 1914. Normal; attended by Dr. Lawson (P.R.)	Good, March, 1914 (A. E. G.)
8	N. C. 33	Mar. 18, 1912 Dr. Harvey	Confinement. Girl, Mar., 1916. "I suppose I had a fairly normal time, and although the doctor had to use instruments just at the last, there was not the slightest tear. I never felt better in my life than during the time I was carrying." (Patient's letter)	
9	I. A. 33	June 16, 1912 Dr. Thomas	Confinement. Girl, September, 1913. Normal	
10	F. M. 33	June 30, 1912 Dr. Barnes	Confinement. Boy, March, 1918. Labour 10 hours, no further particulars (Lewis)	
11	A. P. 28	Mar. 5, 1912	Confinement. Girl, February, 1916. Normal; attended A. E. G. Miscarriage at 2½ months, June, 1916 Miscarriage at 11 weeks, Feb., 1917 Confinement. Girl, August, 1920. Normal.	Good, September, 1928
12	A. C. 27	Dec. 11, 1913 Dr. Kempster	Confinement. Girl, February, 1920. Normal	When three months pregnant cervix was prolapsed. In Feb., 1926, uterus lying back. Refixed, March, 1926

TABLE III.—Continued.

No.	Name and Age	Date of Operation and Doctor	Particulars of Pregnancies	Position of Uterus
13	E. L. 40	Feb. 16, 1914 Dr. J. G. Duncanson	Confinement 2 years later. Normal. (Dr. Rachel Mackenzie)	
14	M. R. 34	June 8, 1914 Dr. Beckett-Overy	Confinement, Oct., 1917. "Everything quite normal" (Beckett-Overy)	"Excellent" (Beckett-Overy). Normal. 1917
15	D. R. 31	June 16, 1914 Dr. Comerford	Confinement, Sept., 1919. Induction for slightly contracted pelvis under Dr. Gilliat	
16	E. C. 30	Nov. 6, 1914 Dr. Dickson	Confinement. Boy, Sept., 1917. Dr. Dickson, March, 1921, miscarriage attributed to motoring.	Good, March, 1922
17	B. D. 35	Dec. 2, 1914 Dr. Jamieson	Confinement. Girl, June, 1916. "Normal pregnancy and labour," B. B. A.	Normal. (Dr. Jamieson)
18	L. B. 27	April 13, 1915 Dr. Grant	"Had a confinement and had a very good labour." (Report from Dr. Grant)	
19	D. J. 30	Oct. 20, 1915 Dr. Finny	Confinement. Girl, May 19. "Labour rather long : forceps"	Good, June, 1920
20	E. B. 35	Nov. 11, 1915	Confinement, Nov., 1923. "Pregnancy complicated by albuminuria. Confinement normal and at full time." (Dr. Campbell)	Normal. (Campbell)
21	E. W. 34	Nov. 17, 1915 Dr. Morier	Confinement by Cesarean Section, Jan., 1920	Good, July, 1925
22	E. H. 36	Mar 6, 1916 Dr. J. W. Wilson	Miscarriage at 4½ months, March, 1917	
23	N. W. 34	May 22, 1916 Dr. Halsted	Confinement in 1922. Normal. Dr. Halsted	Normal
24	E. O. L. 35	Jan. 22, 1917	Confinement, Feb., 1918. Normal	
25	M. S. 31	April 9, 1918 Dr. Banister	Confinement. Girl, 11 lb., 4 hours, normal; attended by Dr. Banister	Normal
26	F. P. 32	Sept. 4, 1918	Confinement. Boy, July, 1924. "For last three months of pregnancy constant discomfort with acute acidity, and had attacks of vomiting last month. So I came to my time weak and worn out, and instead of my usual 4 or 5 hours I had 5 nights and 4 days of pain on and off. But everything was normal at the actual birth and I got on well and made a splendid recovery." (Letter, Aug., 1924.)	
27	G. H. S. 33	Nov. 26, 1918 Dr. Hinds	Miscarriage at three months, 1921, following sudden death of father. Confinement. Boy, 1925. "The confinement was quite normal"	
28	E. D. 28	May 14, 1919	Confinement. Girl, 8 lb., Dec., 1919. "I was lucky in having a very short time."	Normal, Sept., 1924
29	C. O. 36	June 10, 1919 Dr. McIlraith	Confinement, April, 1927 Confinement, 1921	Good (Doctor's report)
30	M. H. 30	Nov. 12, 1919 Dr. Thorne	Confinement, 1924. All normal " 1926. (Doctor's report) Confinement. Boy, Mar., 1928. "Confinement was quite normal." (Letter from Dr. Thorne)	Normal, October, 1927
31	J. B. 35	Nov. 25, 1919 Sir Henry Jackson	Confinement. Girl, August, 1920. " Absolutely normal confinement"	Normal, January, 1925
32	M. B. 34	Jan. 5, 1920 Sir Henry Jackson	Confinement, May, 1923. Normal	?
33	E. H. 34	Jan. 21, 1920 Sir Henry Jackson	Confinement by Cesarean Section, March, 1925, on account of condition present at operation. Boy	Normal, 1926
34	E. H. 37	Feb. 8, 1921 Dr. Erskine	Confinement, Dec., 1926. "Normal confinement" (Doctor's letter)	"Perfectly satisfactory" (Dr. Erskine)
35	O. L. 27	May 18, 1921 Dr. McIlraith	Confinement. Girl, December, 1923. "Breech presentation, child born naturally"	Normal, March, 1929
36	L. B. 34	June 9, 1921 Dr. McIlraith	Confinement. Girl, July, 1926. "The confinement was absolutely normal, the labour lasting less than 2 hours." (Letter from patient)	

TABLE III.—Continued.

No.	Name and Age	Date of Operation and Doctor	Particulars of Pregnancies	Position of Uterus
37	D. J. 27	Aug. 15, 1921 Dr. Maddison	Confinement, 1922. "A child was born next year in Japan: I heard that all had gone well." Dr. Maddison's letter)	
38	H. C. 29	Sept. 19, 1921 Dr. Carter	Confinement. Boy, June, 1923. "The course of labour was normal and not unduly prolonged. The child presented by the breech, but contractions were excellent and the head was delivered without any great difficulty." (Dr. Carter's letter)	
39	G. E. 35	Jan. 19, 1922	Confinement. Boy, February, 1923. "Had a beautiful confinement." (Patient)	Good, April, 1925
40	C. W. 32	May 16, 1922	Confinement. Boy, March, 1924.	Good, December, 1927
41	M. T. 29	June 26, 1922 Dr. Dickson	Normal Confinement. Girl, December, 1927.	
42	E. S. 29	Sept., 1922 Dr. Davies	"Face presentation, but owing to the small size of the child this did not give a great deal of trouble with the delivery." (Dr. Sansom's letter) Confinement. Twins, forceps for the first one (boy and girl, December, 1923), the second a breech, but no particular trouble. (Dr. Davies' letter.) Nov., 1924, 4 months' pregnancy	Good, October, 1924
43	D. B. 26	Oct. 16, 1922 Dr. Brodribb	Confinement. ? date Confinement before operation, prolonged labour, chloroform, forceps; one since operation, easy normal labour (Dr. Brodribb's letter) 2 confinements, both labours quick	"Position of uterus afterwards seemed normal"
44	D. S. 24	Feb. 17, 1923 Dr. Stuart	Confinement, Jan., 1928. "Particulars not known: labour apparently normal." (Dr. Danks' letter)	
45	L. A. 33	March 9, 1923 Dr. Danks	Confinement. Girl, October, 1927.	All in good position, March, 1929
46	R. D. 19	May 5, 1923 Dr. Tench	Normal	Good, June, 1925
47	G. S. 37	May 7, 1923	Confinement, January, 1925 "Confinement straightforward with forceps"	
48	F. A. 32	Nov. 19, 1923	Confinement. Boy, Jan. 1926. Normal	Good, September, 1928
49	Z. S. 28	May 28, 1924 Dr. Sloan Chesser	Confinement. Girl, April, 1928. Normal	?
50	R. S. 34	June 4, 1924 Dr. Power	Confinement. Boy, July, 1927.	Uterus in good position afterwards (Dr. Power's letter)
51	A. H. 23	June 29, 1925 Dr. Mieville	Normal	
52	L. H. 35	July 27, 1925	Miscarriage at 4 months, March, 1929	
53	E. M. 27	Oct. 5, 1925 Dr. Benjafield	Miscarriage. "Had a three months miscarriage with intense pain." (Dr. Mieville's letter)	Normal
54	G. A. 24	Oct. 19, 1925 Dr. Murison	Confinement, June, 1927. "11 lb. baby, difficult labour."	Normal
55	D. P. 25	Mar. 21, 1926 Dr. Kerr	Confinement, April, 1929	
56	S. 33	April 21, 1926 Dr. Gurney Thompson	Confinement, Nov., 1927. "Normal in every way." (Dr. Benjafield's letter)	Satisfactory
57	D. 30	Nov. 30, 1926 Dr. Jepson	Confinement. ? date. Normal. (Dr. Murison's letter)	Normal
58	M. S. 30	Oct. 12, 1927 Dr. Evans	Confinement, 1928, attended by Dr. Kerr. Normal	
59	K. C. 32	Oct. 30, 1927 Dr. Jane Crawford	Confinement, 1928. "Beyond being instrumental, it was a normal labour." (Dr. Thompson's letter)	Normal on examination, April 12, 1929
			Confinement. Girl, February, 1929. "Normal confinement. Perineum remained intact following previous repair." (Dr. Jepson's letter)	Uterus standing well
			Confinement, February, 1929. "The pregnancy and labour were normal in every way." (Dr. Evans' letter)	
			Miscarriage at three months	

*Miscarriages.*—It will be noted that in the first series there were 16 miscarriages out of 60 known results, a percentage of 26·6; in the second series, eight out of 75, or 12%. An analysis of the first 16 is given in the work previously referred to; the particulars of the eight in the later series are as follows:—

One patient had a normal confinement, followed by two miscarriages; another had a normal confinement followed by a miscarriage attributed to motoring. A third patient had a miscarriage at three months—attributed to the sudden death of her father—and a normal confinement four years later. Four other patients had one miscarriage each, no cause being assigned. Clearly, in the case of the first four miscarriages, the blame cannot be assigned to the operation. In the case of the last four, the operation might or might not be to blame, but I think that we may assume that it was not so, because the proportion of eight miscarriages out of 74 pregnancies is probably no higher than would be met with in any ordinary run of cases.

*Labours.*—The particulars given in the tables as to the character of the labours are derived from the statements of the patients or of the doctors who attended them. They can be tabulated as follows: Natural labours, 50; forceps deliveries, 10; induction for contracted pelvis, 2; Cæsarean section, 2; particulars not given, 2. A proportion of 50 natural deliveries out of 64 in which particulars were known, that is 78%, is probably as high as would be met with in any ordinary series of confinements. Indeed, the proportion might easily have been larger, judging from such a statement as that of the patient in Case 3, who said that forceps were used in all three of her confinements, but she thought that she could have done without it if left longer. In the first series of forty-four full-time deliveries there were thirty-two natural labours and eight cases of forceps. The remaining four cases comprised two difficult breech deliveries in the same patient—the children weighing respectively 14 and 11 lb.—and two transverse presentations in one patient, who also had a transverse presentation with the child born before the operation. We have thus records of 110 full-time deliveries, of which 82 (i.e., 75%) were natural. Neither the forceps deliveries, which number 18%, nor the difficulties in the remaining cases, can be regarded as having any relation to the previous operation. We are, therefore, justified in stating, on the evidence of these 110 confinements, that hysteropexy causes no difficulty or complication in a subsequent labour.

*The position of the uterus after confinement.*—We can now deal with the second question contained in the title of this paper: What is the effect of pregnancy upon a previous hysteropexy? Of the 59 cases of the second series I have records of the subsequent position in 38. In one (No. 12), in which pregnancy occurred six years after the operation, the cervix was found prolapsed when the patient was three months pregnant. I did not see her again till six years after the confinement, when the uterus was retroverted and I refixed it. It is probable that the displacement had recurred before she became pregnant, as the prolapse of the cervix was found so early in the pregnancy. In the remaining 37 cases the uterus was found to be in good position after the confinement. In the first series 29 patients were examined after full-time confinement; in one there was a partial retroversion, and in 28 the uterus was in good position. In the two series there were 67 cases; in 65 (or 97%) the uterus was in good position, and in 2 there was a return of displacement (3%). In my first series of after-results I was able to give particulars of 189 cases where no pregnancy had occurred. Of these, the uterus had remained in good position in 179, or 94·7%, and there was recurrence in 10, or 5·3%. Even allowing for the fact that in the early cases the operative procedure was more faulty than in the later ones, it is evident that with 97% of successes in cases of pregnancy, compared with 94·7% in non-pregnant cases, we are justified in stating that pregnancy has no appreciable effect in producing a return of displacement after hysteropexy has been performed.

*Discussion.*—Mr. T. G. STEVENS said he wished to associate himself with Professor Fletcher Shaw in everything he had said as to the treatment of prolapse. He (Mr. Stevens) had been performing practically the same operation for twenty years and was fully satisfied

with the results. There was absolutely no reason to open the abdomen in order to cure the great majority of cases of prolapse. In about 2% of the cases he had found it necessary to perform hysteropexy, or Gilliam's operation, on account of a persistent retroflexion of the uterus, in spite of the vaginal plastic operations. Strictly speaking, however, this addition was in order to cure the retroflexion always associated with severe backache, and in no sense played a part in the cure of prolapse. He (Mr. Stevens) deprecated the teaching of those who often performed hysteropexy in addition to colporrhaphy, however safe it might be in their own hands. Such teaching might well be misunderstood by others less skilled in gynaecological surgery, and hysteropexy alone carried out, with an appreciable mortality, Colporrhaphy, on the other hand, if properly performed, would cure all cases of prolapse, and had practically no mortality.

Mr. L. C. RIVETT said it had not been suggested that hysteropexy alone would cure prolapse of the uterus, bladder, or rectum. A plastic operation on the anterior vaginal wall, and on the levator ani muscles and posterior vaginal wall, combined with hysteropexy, made the patient comfortable. Prolapse was a condition of discomfort; it did not endanger or shorten life, and any operation for its cure should be designed solely to produce comfort. He had met one or two patients—in whose cases, he presumed, the Donald-Fothergill operation had been performed—who suffered from severe dyspareunia, and he had undone part of the operation to relieve this. An operation undertaken for the treatment of a condition of discomfort but which produced severe dyspareunia was obviously food for thought. He (Mr. Rivett) had been distressed to hear the President use the term "transverse presentation" in relation to a pregnancy subsequent to hysteropexy. He would like to know the exact definition of that part of the fetus which was presenting. He sincerely congratulated Professor Fletcher Shaw on his results after subsequent labours. 66% with no recurrence was rather better than nature. Professor Shaw had said that he often operated on patients of 70 or even 80 years of age. He (Mr. Rivett) always needed a great deal of persuasion to operate on patients aged over 70, as he had seen patients on whom a trivial operation had been performed and who had remained bedridden for the rest of their lives. They might as well have stayed in bed without undergoing the operation. The theory of intra-abdominal pressure needed careful thought. It was occasionally brought before this Section in connection with eclampsia and was usually received with reserve. In Mr. Rivett's experience, in about 90% of the cases of procidentia, the women had extraordinarily lax and pendulous abdominal walls, with, obviously, no raised intra-abdominal pressure.

Sir EWEN MACLEAN said he would like to know what Professor Shaw's experience had been with regard to (1) secondary haemorrhage and delayed healing or infection; (2) cases presenting much cicatricial tissue as a result of previous unsuccessful operative treatment; (3) the duration of stay in hospital.

Referring to Dr. Giles's paper, he might mention a case in which, after hysteropexy, the patient had had a normal confinement followed by a pregnancy which at term eventuated in obstructed labour. The cervix was discovered, with difficulty, above the level of the brim of the pelvis in the lower part of the right iliac fossa. Laparotomy revealed that the level of the fundus was anchored low to the parietes by a thick band of fibrous tissue the separation of which was followed by the release and raising of the fundus. The fetus was accommodated by the sacculation of the posterior wall of the uterus. Cæsarean section was successfully performed. No doubt in this case the fixation sutures in the uterus had been passed at too high a level.

Dr. JAMES YOUNG said he agreed that the term "prolapsus uteri" was unfortunate, in that it gave an entirely erroneous idea of the essential pathology of the condition. In prolapse the uterus had no greater significance than the bladder, the vagina, and the rectum. As the vagina was the only invariable element, he had long been in the habit of employing the term "vaginal prolapse," in which cystocele, rectocele and uterine descent were all embraced. He was convinced that hysteropexy was anatomically unsound in the treatment of prolapse, because it could in no way help in the upkeep of the prolapsed bladder and vagina, and even after it had been performed, downward descent of the cervix might occur. Further, the satisfactory results from plastic repair operations made its consideration unnecessary and in this way the added risk of an abdominal operation was eliminated. He was sceptical at the statements of the writers of the papers in regard to their mortality rates. He did not, of course, imply anything more than that unless the greatest possible care was taken in regard to the analysis of statistics, individual deaths over a long period of years

were easily overlooked. For such reasons he was frankly sceptical of the statements of Professor Fletcher Shaw that he had had "several thousands of prolapse operations with two deaths," and of the President that he had done "about 800 hysteropexies without a death."

Dr. PRESTON MAXWELL: I am glad that the question of complications after Fothergill's operations has been raised. What is the quality of catgut used by Professor Shaw? I have had two bad cervical hemorrhages following the operation. It is hardly fair to compare hysteropexy with Fothergill's operation as a cure for prolapse. A combined plastic operation, leaving the cervix intact, and with a hysteropexy low down on the anterior surface of the uterus, often gives excellent results.

Mr. CLIFFORD WHITE said he was entirely in favour of the treatment of prolapse by colpo-perineorrhaphy, but he thought that Dr. Fletcher Shaw had been fortunate in having had no mortality from pulmonary embolism. He himself had had two fatal cases of pulmonary embolism after colpo-perineorrhaphy. Had the patients in the President's cases been much troubled with frequency of micturition after the operation of fixing the uterus by stitches in the lower anterior wall? In his (the speaker's) opinion this operation was bound to prevent the expansion of the bladder, and years ago the late Mr. Glendinning had published a short paper proving that the amount of fluid which the bladder could comfortably hold was diminished after hysteropexy. The presence of an abdominal incision as well as the perineal operation caused the patient to be very uncomfortable for the first two or three days, and this unnecessary pain was an additional reason, in his opinion, for avoiding any form of ventritisuspension.

Dr. G. W. THEOBALD said that the President and the school which he represented had not merely to prove that their results were good, but that they were better than those of the Manchester School, for it was obvious that ventral fixation in the treatment of prolapse could not otherwise be justified. Dr. FitzGibbon and other Dublin operators cured prolapse by shortening the uterine ligaments and perineorrhaphy—without dilating or amputating the cervix and without colporrhaphy. Professor Fletcher Shaw had considerably modified the operation as described by Fothergill—but it was necessary for him to prove that the results of the Manchester operation were better than those obtained at Dublin—otherwise a routine amputation of the cervix and a wide colporrhaphy could hardly be justified.

Dr. A. E. GILES (President) said he agreed with Professor Shaw that hysterectomy was a very bad procedure for prolapse; the prolapse of the vaginal walls remained and the patient's condition was as bad as before. With a great deal of the method described in the paper he was in agreement, but he strongly deprecated the practice of amputating the cervix in every case. Hysteropexy rendered this unnecessary, except in very special instances. In his own paper he had confined himself to one particular point—the relation of hysteropexy to pregnancy—and he had not gone into any details. Naturally, however, when hysteropexy was performed on account of prolapse, it was combined with plastic operations on the vagina, that was to say, with colporrhaphy and perineorrhaphy. He was surprised at the incredulity of some speakers as to the possibility of a long series of cases of hysteropexy without a death. In his view it was an operation that should be attended by practically no mortality, and in his own practice he had had no deaths in the last 900 cases.

Professor FLETCHER SHAW (in reply) said that he had been criticised for performing colporrhaphy upon elderly women. In his experience, patients who were between 60 and 70 years of age and in good health stood this operation as well as younger women did, and it appreciably increased their comfort and happiness. He was sorry that some speakers still considered it necessary to perform hysteropexy in addition to colporrhaphy, and he hoped that they would give colporrhaphy, by the method described, a thorough trial, after which he felt sure, hysteropexy would be discarded as unnecessary. He agreed with Dr. Young that memory was often unreliable, and though he had not meant to lay any great stress upon the mortality, he would have all his case records thoroughly investigated before the paper was published.

[POSTSCRIPT.—Since reading the paper I have had all my records of both hospital and private patients searched, and have found a few more deaths, as Dr. Young suggested might be the case. Records of these are now embodied in the paper.—W. F. S.]

## ADDENDUM

to "FURTHER STUDIES IN OSTEOMALACIA," by J. PRESTON MAXWELL, M.D., F.R.C.S., *Proceedings*, 1930, xxiii, 639 (*Sect. Obst. and Gyn.*, 19).

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## Section of Odontology.

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[March 24, 1930.]

### Dental Sepsis—A Retrospect.

By Sir WILLIAM WILLCOX, K.C.I.E., C.B.,  
C.M.G., M.D., F.R.C.P.

I PROPOSE to confine my remarks to the part which dental sepsis plays in the causation of diseases of other organs, and to review the position in which this question stands to-day.

That dental disease with consequent sepsis is as old as the human race is proved by examination of skulls dating back to the earliest times. The writings on the subject of diseases of the teeth and gums date back at least two hundred years.

Dental sepsis as a powerful aetiological factor in the causation of systemic diseases was first brought to the notice of the medical profession by Dr. William Hunter who read a paper entitled "Oral Sepsis" before the Odontological Society of Great Britain in 1900, and who since that time has worked unceasingly on the subject. Hunter was led on to the special study of oral sepsis by his previous work on pernicious anaemia, from 1890-1900. He was the first to call attention to a constant and remarkable symptom of that disease, namely, "glossitis," and the inflammatory involvement of the surface of the tongue led him to think that the disease must be a consequence—rather than a cause—of the dental sepsis which he usually found present. Previously to 1900 it was not generally realized that dental sepsis was the cause of those other diseases now recognized to be due to its effects. Indeed, the opposite view seems to have been held, namely, that diseases of the teeth and gums were rather the result than the causes of these other diseases.

Before the year 1900, teeth were regarded purely from the physiological point of view of being aids to mastication. They were retained as long as they proved good masticators. Little or no attention was paid to the far-reaching pathological effects which might result from the diseased periodontal tissues surrounding an infected tooth. In 1914 a paper was read before this Section by Dr. (now Sir Thomas) Horder entitled "Dental Sepsis from the point of view of the Physician" and calling attention to the effects of dental sepsis in producing various diseases of other organs.

In 1922 a paper on "The Clinical, Pathological and Radiological aspects of Infection of the Teeth and Gums" was read by me at the opening of a Discussion at the Medical Society of London, and in 1923 I gave a Dental Board Lecture entitled "The Diseases of the Periodontal Tissues due to Infection in their Relation to Toxæmia: The Systemic Effects." It may be unhesitatingly said that the theory of dental sepsis as an aetiological factor in the causation of systemic disease stands to-day on a firmer foundation than ever. I have been much impressed by the grasp of the situation by dental surgeons and practitioners of general medicine throughout this country. To-day it is much less common, either in hospital or in private practice, to find patients with many septic teeth in their mouths.

*Mode of Action of Dental Sepsis.*—Dental sepsis may act: by (1) direct local infection of other organs. For example, the tonsils and naso-pharynx may be

infected by the organisms from the diseased periodontal tissues present in the mouth. The maxillary antra may be infected by spread of infection through the floor of the antrum from underlying infected dental roots. The swallowed organisms may give rise to inflammatory conditions of the gastro-intestinal tract and cause gastritis, gastric and duodenal ulcer, enteritis, colitis, appendicitis, cholecystitis, diverticulitis, etc. The presence of achlorhydria, as pointed out by Dr. A. F. Hurst, may be a predisposing factor in the causation of infection of the gastro-intestinal tract, since the gastric juice, owing to the absence of the natural hydrochloric acid and gastric ferments, loses its antiseptic power and does not destroy the swallowed organisms.

I should like to call attention to some conditions of the jaws which appear to be caused by dental sepsis from local infections. A marked thickening of the alveolar process of the superior maxilla not infrequently occurs which is not malignant, but is due to a localized osteitis involving the whole alveolus. Two such cases are at present under my care, and no doubt the seeds of infection resulted from the septic teeth originally present. Several cases have recently come to my notice where a projecting bony ridge has developed on the inner aspect of the alveolus of the lower jaw, due no doubt to a localized osteitis. In one of these cases the removal of all the teeth was followed by a crumbling away of the bony ridge.

(2) Blood-stream Infections.—The organisms or the toxins produced by them may be carried from the dental focus of infection and produce far-reaching effects in any part of the body. This mode of transference appears to be the usual channel by which disease in other organs is produced, and its importance cannot be too strongly emphasized. It can thus be understood that through the vehicle of the blood-stream, dental sepsis may give rise to conditions of toxæmia, acute, subacute or chronic, or even acute septicæmia and septico-pyæmia. Numerous examples of these conditions resulting from dental sepsis could be quoted from my records. Blood conditions, such as secondary anaemia, pernicious anaemia, leucocytosis, and in some cases leucopenia, may be caused by the effects of the absorbed toxins. The absorbed toxins alter the composition of the blood-serum and lymph. This means that the cells and tissues of all parts of the body are surrounded by a nutritive fluid containing deleterious harmful products. Can it be wondered at that pathological changes in the cells of other organs are sometimes produced, with the resulting clinical symptoms of disease and alteration of function of the affected organ? In this way can be explained the large group of general diseases caused by dental sepsis which were fully enumerated in my paper opening a discussion held by this Section in 1923.<sup>1</sup> Time will not permit of the repetition of this list, but it may be asserted with confidence that not one of the diseases mentioned should be deleted from that list; on the contrary, additions might be made to it.

The Organisms.—The organisms most commonly responsible for dental sepsis and its resulting effects on other organs are those of the streptococcal group. (i) The viridans group which produce a greenish coloration when grown in blood agar owing to the formation of methæmoglobin. These are most commonly associated with the production of chronic rheumatism and other systemic diseases. (ii) The indifferent group which used to be regarded as non-toxic, but which during the last few years have been definitely associated with systemic disease such as chronic rheumatic conditions, infective endocarditis, etc. One member of this group, *Streptococcus mutans*, was isolated by Dr. J. K. P. Clarke and has been found to play a part in the causation of dental caries, and also to be associated with secondary systemic diseases such as chronic rheumatism and endocarditis. (iii) The haemolytic group. These decolorize blood-agar culture medium and lake red blood-corpuscle. They cause severe toxæmia and are found in the anaemias due to dental sepsis; they are also found in other resulting systemic conditions. (iv) The anaerobic

<sup>1</sup> *Proceedings*, 1923, xvi (Sect. Odont., 7).

group. These have been found in the roots of infected teeth. They have been studied recently and have been found to be associated with the production of systemic diseases such as chronic rheumatism. Two such cases are at present under my care.

It must be remembered that each of the groups of streptococci above enumerated includes many varieties of these organisms and that these individual varieties may produce different clinical manifestations.

Staphylococci are very rarely found in infected roots of teeth, they are much more commonly associated with naso-pharyngeal infection.

In 1922 the *Bacillus acidophilus odontolyticus* was isolated by McIntosh, Warwick James and P. Lazarus Barlow. This organism may cause dental caries. It has not been associated with resulting systemic diseases.

*General Factors influencing the Effects of Dental Sepsis.*—The effects of dental sepsis depend on the nature, rate and amount of toxic absorption, and also on the immunity of the patient to the absorbed products of infection.

Thus we have to consider:—

(1) The virulence of the organism.—This varies very much. Some organisms are relatively non-toxic while others have a high degree of toxicity. An estimate of the virulence of an organism can be gauged by the toxic effects of a given dose of vaccine on a healthy individual. The varying degree of virulence in the organisms producing dental sepsis shows how important it is to begin with very small doses when vaccine treatment is being given. A large dose of a vaccine from a virulent organism may cause a harmful effect and indeed completely destroy the immunity of a patient. A case (Miss Y.) has recently been under my care at St. Mary's Hospital. Acute widespread arthritis was present, due to a surface infection of the naso-pharynx and colon with *Streptococcus viridans*. It was found that minute doses of vaccine (1,000 organisms) caused severe reactions in the patient. The vaccine was then tried on a healthy person and was found to be extremely toxic. In this case the organism was unusually virulent. Some degree of sensitization was present in this case; it was removed by the method described below.

(2) The amount and rate of toxic absorption.—These are very important. When there is free drainage of septic products, the toxic symptoms are often of low degree. When there is closed sepsis, the products of the focus of infection find their way directly into the blood-stream by way of the lymph and may cause marked toxic effects.

(3) The immunity of the patient.—This is also most important. The resistance of a person to a dental infection may be broken down by the constant dosage of the blood-stream with toxic products from the focus of infection.

A condition of sensitization then results and marked general reactions may follow comparatively small doses of the toxins. This may show itself by the occurrence of skin rashes such as erythema and urticarial eruptions, attacks of asthma, gout or angio-neurotic oedema.

In sensitized patients a very minute dose of vaccine will produce severe reactions and give rise to unpleasant clinical effects, causing an exaggeration of the secondary systemic conditions.

When sensitization exists, the first step in treatment is the removal of the focus of infection. An additional measure, recently tried with success in some cases under my care at St. Mary's Hospital, has been the intravenous injection of small quantities of immunized blood (10 c.c.) every three or four days for about five doses. Afterwards an autogenous vaccine can be tolerated in small—and gradually increasing—doses, at intervals of from five to seven days. The overcoming of the sensitization is accompanied by marked clinical improvement in the systemic condition present. The immunized blood is obtained by inoculating a healthy donor of suitable blood-group with the autogenous vaccine of the patient. A study of

cases of dental sepsis shows how little separates health from disease; a slight cause may transform a condition of apparent health to one of acute and painful illness. Thus overwork, the physical strain of over-exertion, an injudicious over-dosage with vaccines, and many other causes, may completely break down the immunity of a patient and cause severe systemic effects. The adverse effects on immunity of unhealthy hygienic conditions such as inadequate diet and impure atmospheric surroundings must be borne in mind, while mental anxiety and depressing emotional conditions must not be forgotten.

*Symbiosis* has an important bearing in relation to the effects on the immunity in the case of dental sepsis. Thus, while a patient suffering from dental sepsis remains in apparent health, some additional toxic factor resulting from an intercurrent infection may cause a marked manifestation of the systemic effects. This is often seen when an attack of influenza, or other acute infection, leads to an attack of arthritis or some other systemic manifestation of the pre-existing dental sepsis. In a similar manner, dental sepsis, by reason of its resulting toxæmia, may enhance the recurrence of diseases which otherwise would yield quickly to treatment. Thus boils, which are due to a staphylococcal infection, are apt to recur constantly over long periods if associated dental sepsis is present. Its removal is often followed by a cessation of the recurrences.

*The Clinical Examination of the Teeth and Gums.*—This is the first and most important step in the determination of the presence of dental sepsis. The expert examination will reveal unhealthy conditions of the gums and teeth and, of itself, determine a diagnosis. I have at the present time a patient in St. Mary's Hospital (Mrs. A.) in whom radiographic examination shows little abnormality, yet clinical examination reveals the fact that pressure on the gums causes exudation of pus around every tooth. A condition of pyorrhœa is present, but it has caused no bone erosion or periapical necrosis.

It must, on the other hand, be remembered that in persons who pay attention to dental cleanliness, the teeth and gums may appear healthy, but yet deep-seated disease may be present. Sir Frank Colyer, in his book on chronic general periodontitis, has emphasized the importance of supplementing the clinical examination by a skiagraphic one.

*Radiographic Evidence.*—This is so universally obtained to-day that it is unnecessary to recapitulate the signs shown. In my opinion every patient suffering from any illness which may reasonably be thought to be due to the systemic effects of dental sepsis should be subjected, when possible, to a radiographic examination of the teeth.

The importance of periapical necrosis is fully realized to-day. There has been, perhaps, a tendency to direct attention too closely to this form of dental sepsis, and to attach insufficient importance to alveolar erosion and general rarefaction or condensation of bone around infected teeth. These conditions are worthy of equal attention. The presence of dental cysts and granulomata is of great importance, for these frequently become infected, and in cases showing the systemic effects of dental sepsis their radical treatment is called for. The presence of dead teeth and pulpless or crowned teeth must not be overlooked. They are always potential sources of danger. When there is systemic disease, which may be due to dental sepsis, and for which no other cause can be assigned, removal of these teeth requires serious consideration and will probably be a wise procedure.

*Secondary Infections arising from Dental Sepsis.*—Attention has been called to the occurrence of these as the result of direct transference of organisms to the naso-pharynx or alimentary tract. For many years complete bacteriological examinations of the cases under my care at St. Mary's Hospital have been carried out. It has been found in a large proportion of cases (about 90%), in which dental sepsis has existed for over a year, that there is evidence of the presence of similar organisms

in the intestinal tract. No doubt the tubular glands of the intestine become infected and carry on the infective process. It is important to realize the part played by secondary infections, because they may carry on the infective process after the dental sepsis has been removed. These secondary infections always require treatment, otherwise the systemic effects of the original dental sepsis may fail to show improvement.

*Evidence for the Conclusion that Dental Sepsis is the Source of Infection.*—The decision on this point calls for the most careful scientific investigation and the exercise of great judgment. It must be remembered that dental sepsis causes a streptococcal toxæmia, and it is this which produces the manifold effects of disease in other organs. A streptococcal toxæmia of exactly similar nature may arise from a focal infection in other parts of the body. Thus, the primary seat of the infection may lie in the tonsils, accessory nasal sinuses, intestine, urogenital tract, or elsewhere in the body. Then, again, other organisms than streptococci, such as gonococci, dysentery bacilli, *B. melitensis*, etc., may cause similar systemic manifestations. The most careful investigation must always be made in every case of disease which may be due to dental sepsis, before incriminating the teeth. All other possible primary foci of infection must be excluded. When this is done, the evidence from the clinical and radiographic examination of the teeth must be carefully considered. If there is undoubted evidence of dental sepsis, and the general clinical condition of the patient points to this as a reasonable and possible cause, then the decision as to its being so is based on a sure foundation.

*Should Dental Extractions be Carried out?*—When dental sepsis is present the offending teeth should be removed. The condition of the patient calls for the utmost care in this procedure. When the immunity is low, it is wise for only one or two teeth to be removed, the patient being kept in bed under observation.

In some cases a marked pyrexia and severe systemic reaction results. This calls for an interval of two or more weeks before any further operative treatment is carried out, the patient being kept at rest in the interval. I have, on several occasions, seen a fatal septicæmia and malignant endocarditis follow the extraction of infected teeth in a patient in poor health and with a low immunity. In elderly people (over 60) the resistance to infection is often low and the power of tissue repair may be poor. In such cases extractions should only be carried out when really necessary.

In some cases presenting definite systemic effects, for which no cause can be assigned but the teeth, there may be only slight evidence of dental sepsis from the clinical and radiographic examination. In such cases if the final careful consideration condemns the teeth they should be removed. Often in cases of this type there has been previous gross infection of some teeth which have been removed. In such cases some of the remaining teeth may carry on the infection and show only quite slight signs from the joint examination.

In 1924 Sir Frank Colyer and I had such a case under our care. This patient, a medical practitioner, had for three months been suffering from malaise and slight pyrexia reaching at night to 100° F. Radiographic examination showed apical infection in connection with ten teeth that were removed. The temperature became normal afterwards for four weeks, but then the symptoms of malaise and slight pyrexia (99·5°) in the evening returned. After most careful investigation no other cause but dental sepsis could be assigned. The signs of dental sepsis, both clinical and radiographic, were so slight that they would have been disregarded in a person of normal health. In view of the history of the case it was decided that all the teeth should be removed. This was done and the patient has been in good health ever since.

The extraction of teeth without adequate evidence that they are the causal factor in the illness cannot be too strongly condemned. One not uncommonly sees cases of arthritis in which all the teeth have been extracted and yet the disease progresses

without interruption. In such cases some other causal factor is present and this can always be discovered by a sufficiently careful investigation.

*Dental Sepsis may be Secondary to some other Disease or Toxæmia.*—An excellent illustration of this is scurvy, in which marked gingivitis is one of the earliest symptoms. A restoration of the patient to a dietary rich in the necessary anti-scorbutic vitamins is followed by a rapid diminution of the gingivitis and often by complete disappearance of the dental sepsis.

Mercury is well known as a frequent cause of dental sepsis, which in such cases clears up on the cessation of administration of the drug.

Acute diseases such as typhoid fever, dysentery, etc., often give rise to gingivitis and dental sepsis. A patient (Mrs. C.) was recently under my care, having had for three years intermittent attacks of pyrexia, occurring every three or four months and lasting several days. These attacks were associated with marked swelling of the gums. In the intervals between the attacks the clinical and radiographic examinations failed to implicate the teeth. Careful investigations showed definite evidence of a chronically inflamed appendix which was undoubtedly the cause of the attacks of pyrexia and associated gingivitis. No teeth were removed in this case.

*Conclusions.*—(1) Dental sepsis is the commonest focus of infection in the body and must be regarded as one of the most frequent sources of disease of adult life. It is of great importance in relation to illness in the pre-adolescence period.

(2) Dental sepsis, by reason of the great advances in medical and dental knowledge, can be diagnosed with accuracy, and its causative effect in various diseases can be gauged.

(3) The dental surgeon, with whom must rest the final decision as regards dental extractions, plays a most important part not only in the essential treatment of most of the common prevalent diseases but in the prevention of the many illnesses which may arise from untreated dental sepsis.

*Discussion.*—Mr. A. T. PITTS said that the dentist, perhaps, would not look at the problem of dental sepsis quite from the same point of view as the doctor. The dentist was obliged to be extremely careful because it was he who had to be the executioner, and any blame would be likely to fall upon him rather than upon the physician. In reviewing the salient points in the evolution of focal infection and referring to the pioneer work of Hirst and Weston-Price he (Mr. Pitts) held that what was really needed was some means whereby it would be possible to discriminate whether in any given case, especially in those in which the patient was over 40 years of age, the dental sepsis which might be present was the cause of the general disease. Though it had to be admitted that brilliant victories were often gained, there remained a large number of instances in which the dental sepsis was dealt with drastically in the hope of relieving or removing some diseased condition, but the outcome of the experiment could not be foretold; the patients might be cured or they might not. Added to this was the fact that in a great many cases the teeth were free from pain and were still functional.

Dr. A. LIVINGSTON, dealing with the subject in a retrospective sense so far as the London school-child was concerned, said that oral sepsis had been reduced from 94 or 95 per cent. to, at most, 4%, and that this remaining 4% could scarcely be dignified by the name of oral sepsis. While, however, the prevention of oral sepsis in the child up to the school-leaving age had resulted in increased educability and healthiness, and while it had removed a great deal of the terrors of zymotic diseases, such as scarlet fever, there existed still an enormous amount of sepsis in the pre-school child, and this was, unfortunately, increasing. Dental surgeons looked to their colleagues in the medical profession to give the country a lead in emphasizing the need of greater attention to ante-natal conditions and to the mouth hygiene of the young child. Even to-day, for example, it was astonishing to find the number of people possessed of the idea that the temporary teeth were not important. The chief and most striking improvement in the present-day child was in the matter of nutrition. Cases of real malnutrition in the County of London were now becoming rare because the child had teeth with which he could eat, and, having chewed his food, he could digest it. Sir William, early in his paper, had raised the question of open *versus* closed sepsis, and had given the

impression that he regarded closed sepsis as more important than open. He (the speaker) considered that the open type was of great importance. Case after case had occurred in which simple painting of inflamed and pyorrhætic gums (as advised by Dr. Hunter) would reduce the amount of the secondary condition. Another point regarding closed sepsis referred to the view expressed by Dr. Hunter and Sir William Willcox that once focal infection was established in the mouth, any other part of the body could become a focus of infection. In the enormous group of anaemias a certain amount of failure had to be faced, for attention to oral sepsis by itself would not effect a cure or an improvement, because there was an established focus elsewhere; in fact, the whole body was septic. He (Dr. Livingston) also condemned rash diagnosis and treatment based by radiologists upon X-ray examinations. That, he considered, was being carried too far. Another trouble was that of over-interpretation of X-ray films. Sir William had drawn attention to the antrum, and he (Dr. Livingston) held that far too little attention was paid to the sinuses.

On the subject of vaccines, it was his opinion that they were often best given by the bacteriologist, who knew what he had put into them and was frequently best able to assess reactions. Vaccine treatment was very useful, but it had to be given with the utmost caution. That led to a further point: many failures could not be explained, and it was possible by over-immunization to demolish the patient's resistance completely. Perhaps Sir William would explain the interval of five or six days to which he had referred in his paper. He (the speaker) and his colleagues usually provided for a longer interval than that.

He agreed with Sir William that rather than extract a large number of teeth, it was better to take out a few teeth on repeated occasions, spacing the interval as if one were using vaccine, because each socket became a culture tube and produced its toxins which the patient had to fight. He preferred to perform a trial extraction, taking out, at most, one or two teeth; having cultures made from them by every possible method, including the anaerobic, and then preparing a vaccine. The patient's reaction to the trial extraction could thus be discovered. In conclusion he wished to emphasize the wonderful effect of a fruit diet in cleaning up the large bowel, and the advantages of such a diet in connection with oral hygiene generally.

Mr. A. F. MACCALLAN: Dental sepsis as a cause of ocular disease has been known to ophthalmic surgeons for many years. A considerable experience of the association of the two conditions has enabled me to make several contributions to medical literature on the subject.<sup>1</sup>

Among the ocular diseases which, in certain cases, may be cured or improved by clearing up dental sepsis are hyper-lacrimation, blepharitis, episcleritis of the subconjunctival variety, ulceration of the cornea, iritis and cyclitis. I have seen cases in which these conditions were cured by the removal of dental sepsis without any other form of treatment; in fact this is a daily experience in my hospital and private practice.

The most common causes of dental sepsis producing ocular disease are septic roots, buried fragments of previously extracted teeth, unerupted impacted teeth, residual sepsis, and the condition which is called pyorrhœa. I believe that I have stated these causes in order of frequency, according to my present experience.

In looking through my notes of cases seen in private ophthalmic consultation during the last two years, I find that I have had dental radiographs taken of ten patients in whom the presence of unerupted impacted teeth was shown. In each of these patients it was the presence of ocular lesions which suggested the advisability of dental radiography.

Case I.—The patient was a woman, aged 23, who had injured one eye while playing golf. It was considered possible that a foreign particle might have penetrated the globe. When I saw her, a fortnight after the accident, there was well-marked cyclitis: this was recognized by the marked circum-corneal redness, the keratitis punctata, and the marked cloudiness of the vitreous. As a matter of precaution the eyeball was radiographed, and was seen to contain no foreign body opaque to X-rays. The patient told me that she had had pain over the site of an unerupted wisdom tooth, and had had the gum lanced. I then had full dental radiographs taken, which showed the four wisdom teeth to be unerupted, impacted and septic. On examination by Mr. Frank Lawrence, it was found that pus welled from the site of the lower right third molar on pressure. Mr. Lawrence removed the four third molars under

<sup>1</sup> MacCallan, *Transactions of the Ophthalmological Society, U.K.*, 1928, xlvi, 181; *Proc. Roy. Soc. Med.*, 1929, xxii, 328 (Sect. Ophthal., 14); *Dental Surgeon*, 1928, xxv, 569; *Westminster Hospital Reports*, 1929, xx, 63; *Arch. of Ophthal.*, New York, 1930 (in the Press); *Brit. Med. Journ.*, 1929 (ii), 943.

general anaesthesia, and on the third day after the operation the obvious sign of inflammation, the redness of the eye, had disappeared, and the keratitis punctata was diminishing. I have since heard from an ophthalmic surgeon that the eye is now normal. This is the first case of cyclitis due to impacted wisdom teeth which I have seen. In hospital practice cyclitis due to other forms of dental sepsis is very common.

CASE II.—This was a case of irido-cyclitis in a man aged 37. There was marked ciliary injection, keratitis punctata, and a muddy-looking iris. He was sent to Mr. Gilbert Chubb, who said that the tonsils were septic and should be removed. Radiographic examination of the teeth showed that there was one apical abscess and one unerupted, impacted third molar. Clinical examination by a dental surgeon confirmed the radiographic findings, and an opinion was given that the impacted tooth was septic; it was also stated that there were two other dead teeth in the mouth which it would be better to extract in view of the ocular condition. However, the patient consented to the removal of the abscessed tooth only. A few days after this extraction the keratitis punctata increased considerably; a week later the condition had improved so much that the keratitis punctata was only just visible; while after three weeks the condition was cured and no relapse has occurred during a year's observation. It appears that in this case, at least three different foci of sepsis were present, that the easiest to deal with was selected for removal, and that this happened to be the one which was causative of the ocular disease.

CASE III.—The patient was a woman doctor, aged 25, who came to me to get her glasses changed. She showed acquired opacities of the lenses, coronary in type, though with a myopic correction she obtained full vision in each eye. As, in my experience, lenticular opacities are commonly associated with some form of focal sepsis, I had her teeth radiographed, when it was found that there were three unerupted third molars, and two teeth with apical changes. These were removed by operation, when it was found that the right upper first molar communicated with the antrum from which pus flowed. The condition was dealt with. It was fortunate that the presence of the lenticular opacities led to the discovery of the dental and antral conditions, as the doctor was going abroad.

CASES IV TO X may be taken together. Information as to the dental condition was sought in all these cases as the result of observing pathological changes in the eyes. These changes were as follows: Acquired opacities in lenses and vitreous detected with the slit-lamp, 2; blepharitis or inflammation of the lid margins, together with vitreous opacities detected with the slit-lamp, 3; vitreous opacities detected with the slit lamp, 2. In two of these cases I have information that the impacted teeth were removed by the patient's own dentist; concerning the remainder I have no knowledge, though a copy of the radiograph was given to the patient in each case to take to his own dentist, or was sent direct to the patient's dentist.

In these ten cases of impacted teeth, and in the numerous cases of the same condition which have been discovered among my ophthalmic patients at two hospital clinics, there are invariably pathological changes in the eyes, and it is these which have led to their discovery. The ocular changes are usually very slight, but not on that account to be neglected. Indeed, for toxins manufactured in the mouth or elsewhere to be in sufficient strength in the blood current to affect the eye, there must be considerable activity of focal sepsis, and this points to the desirability of removing impacted teeth wherever found.

DR. E. STOLKIND said that he could not agree with Sir William Wilcox on many points. Teeth were important for the mastication of hard food, but much more depended on the state of the stomach. His (Dr. Stolkind's) observations on a great many patients, whose teeth had all been removed and who, for some reason or other, had no artificial teeth, showed that those persons remained quite healthy if the stomach was in normal condition and if the food they ate was suitable. Usually the condition of patients who suffered from organic diseases of the digestive system, wrongly attributed to oral sepsis, did not improve after extraction of the teeth, and in those in whom there was an improvement, this could usually be traced to treatment by diet, etc., and not to the extraction. He (Dr. Stolkind) was continually coming across such cases, and only that day at the hospital he had seen two cases in which all the teeth had been removed on the advice of the local doctors. Both patients suffered from indigestion with pain and neurasthenia, and neither of them had derived any benefit from the extraction: one was still exactly in the same condition, while the other improved after proper diet and treatment. The diseases which caused what was known as oral sepsis were purulent gingivitis, alveolar pyorrhœa and apical abscess. Purulent gingivitis and also true alveolar pyorrhœa were usually consequences of general ill-health and impaired nutrition. Pyorrhœa was often found to improve with the general health of the patient, as the resistance

to infection was thereby increased. Pyorrhœa was a local disease and did not produce any morbid effects. Dental surgeons should endeavour to cure the local condition by treatment, while the physician must deal with the general health of the patient. In cases of infected pulpless teeth or of an alveolar abscess, there was usually no communication with the general circulation, and it became a purely local phenomenon. Chronic alveolar abscess might necessitate an extraction of the tooth and treatment of the focus, though in apical granuloma it was doubtful if there could be an escape of toxins and bacteria into the other parts of the body. General infection from septic teeth, if it existed (and this had still to be proved) must be very rare. Only the following complications could, in his opinion, be at all related to dental sepsis : trigeminal neuralgia, empyema of the maxillary antrum, cervical adenitis, dental osteomyelitis and angina Ludovici. No proof had been forthcoming that septicæmia and pyæmia, articular rheumatism, etc., were due to dental sepsis. Diseased teeth and roots should be treated, if possible, without extraction, which should only be performed as a last resort when they were no longer of any use as teeth. Almost every disease had, in turn, been attributed to dental sepsis, and a Government Committee's report had stated, without pathological, bacteriological or clinical justification, that one-third of all the disease in England was due directly or indirectly to dental disease. Numbers of people had their teeth extracted for every conceivable disease. His own experience was that in more than 90% of the cases there was no improvement; many, indeed, had felt worse afterwards. He would quote the case of a dental surgeon who had come to him suffering from gout and neurasthenia. The patient had already had thirteen of his teeth removed in order to cure the gout, being convinced that the teeth were the cause of it, especially as X-ray examination had showed some rarefaction. Gout, as was known, was a disease of metabolism, and the removal of the teeth could not cure it. Neither should rarefaction be taken as any indication for the extraction of teeth. Another patient with trigeminal neuralgia of the left side and a history of malaria had had all his teeth removed, but his condition remained the same. A female patient, aged 36, suffering from indigestion and neurasthenia, was advised to have her teeth removed. As she did not believe this to be necessary she consulted two other doctors, whose advice was the same as that given by the first doctor. The teeth were removed, but the condition did not improve. Another female patient, aged 59, suffered similarly, and on the advice of two doctors, had her teeth removed. Her indigestion was worse afterwards and she had headaches and was more nervous. A female patient, aged 27, had nine teeth extracted. Indigestion had since developed and her nervous condition had become worse. A case was reported of a doctor who noticed some irregularity of the heart after influenza, and two local men diagnosed myocarditis. As the cardiac symptoms began to disappear after the extraction of four dead teeth, all the other teeth were taken out at the wish of the patient himself. That case was described as a proof that myocarditis was caused by bad teeth, but in reality it was not a case of myocarditis at all, the irregularity being a temporary "nervous" symptom due to the influenza.

In his (Dr. Stolkind's) view, the wholesale extraction of teeth was unnecessary, though he agreed that if a diseased tooth was beyond repair, it should be removed.

Mr. WATSON TURNER said that he attached great importance to the skiagram. It could be exceedingly valuable if taken after a thorough clinical examination had been made, and would give a good idea of the amount of infection going on in the jaw. In his (the speaker's) view, a man who took a good skiagram was perfectly entitled to give an opinion as to what should be done regarding the treatment of the patient. Dr. Livingston had emphasized the advisability of proceeding very carefully in the extraction of teeth, but a point not stressed was the need of careful local treatment previous to extraction, followed perhaps by the careful extraction of one tooth for examination purposes.

Great benefit was to be derived from using a general anaesthetic; far less harm was likely to be done than when operating with the patient under ordinary gas.

Mr. J. G. TURNER, in reply to Sir William Wilcox's inquiry as to whether anybody had had experience of bony outgrowths, said that about thirty years since he had pointed out that these were entirely due to pyorrhœa.

Had Sir William evolved any laboratory test for virulence of the streptococci? Had he found as a general rule that bodily resistance always failed, in the course of time, in those cases of dental sepsis? Had he formed any opinion as to which of the X-ray appearances indicated danger of infection in periapical cases? How did he consider that the colon was infected when the same germ was found in the mouth?

With regard to multiple extractions, the case detailed seemed to show that by ones and twos was really the most dangerous method. What was Sir William's considered opinion on that point? He (Mr. Turner) was at a loss to understand the meaning of "secondary dental sepsis" in the sense in which it had been used. Was it possible to have normal teeth without sepsis to some extent? He had in mind certain cases in which throat surgeons and abdominal surgeons had held that it was best for the patient to be quit of all teeth, and so get rid of all possibility of dental sepsis. In considering the question of scurvy, it seemed obvious that the dental sepsis was always there, and what happened was infection of tissues of lowered resistance. It was surely more reasonable to speak of that than of "secondary dental sepsis."

Mr. A. BULLEID said he assumed that dental sepsis was far less a matter of importance in elderly people than in younger persons, as older people appeared to be less susceptible to streptococcal infections. With regard to assessing the immunity, or otherwise, of a patient in a given case of dental sepsis, one finding that gave assistance was the agglutination reaction. As to the question of extractions, where there was reason to suppose immunity was low, a valuable safeguard was the differential blood-count. Other speakers had referred to the infallibility of the skiagram; he (Mr. Bulleid) had always associated the skiagram with the Wassermann test in one respect, namely, that a negative finding was of little or no value.

Sir WILLIAM WILLCOX (in reply) said that it was necessary to have a thorough systematic investigation of each case, with the aid of experts in different branches, to give opinions on their special aspects in order to decide whether teeth should be extracted or not. If teeth were removed because there was some systemic disease present which might be due to the teeth, a great risk was taken; the disease might, for example, be caused by an infected antrum. Dr. Livingston had made some interesting remarks regarding dental sepsis and school children. Comparing the children of to-day with those seen twenty or thirty years ago, the improvement in this respect was astonishing. Operations on cervical glands used to be very common; they were now comparatively rare. The reason for that was that oral sepsis and throat sepsis were not present in children now to anything like the same extent that they were formerly. Dealing with another point, he (Sir William) agreed that the body became saturated with germs in certain cases and that by the time the removal of infected teeth was considered, there were other foci throughout the body.

In the administration of vaccines it was his practice to begin with a very weak vaccine and use it at intervals of five or six days, afterwards spacing the intervals out to fourteen or twenty-one or twenty-eight days. In order to find a correct dosage it was usual to begin with small quantities at shorter intervals.

With regard to scurvy, it was unusual to find the condition in adults in this country. In Mesopotamia during the war, he (Sir William) had seen something like 15,000 cases of scurvy, and it was extraordinary how quickly scorbutic gums developed in cases of acute disease, especially in patients fed on tinned milk. In the treatment of acute diseases in England he always arranged that the juice of several oranges or grape fruit should form part of the dietary. He had been delighted to hear Mr. MacCallan's views on the importance of dental sepsis in ocular disease, in the treatment of which he (Mr. MacCallan) had had most excellent results. Dr. Stolkind had emphasized the importance of diet, and everyone would agree with that. With regard, however, to Dr. Stolkind's belief that dental sepsis did not cause rheumatism, he (Sir William) would like to show him some cases, which, he believed, would shake his opinions. The most dramatic results were obtained in cases not too far advanced. It was difficult, he admitted, to give precise and convincing proof, because, in local lesions of chronic rheumatism there were, as a rule, no living organisms, and the conditions were probably due to toxic products from the focus of infection which led to inflammation.

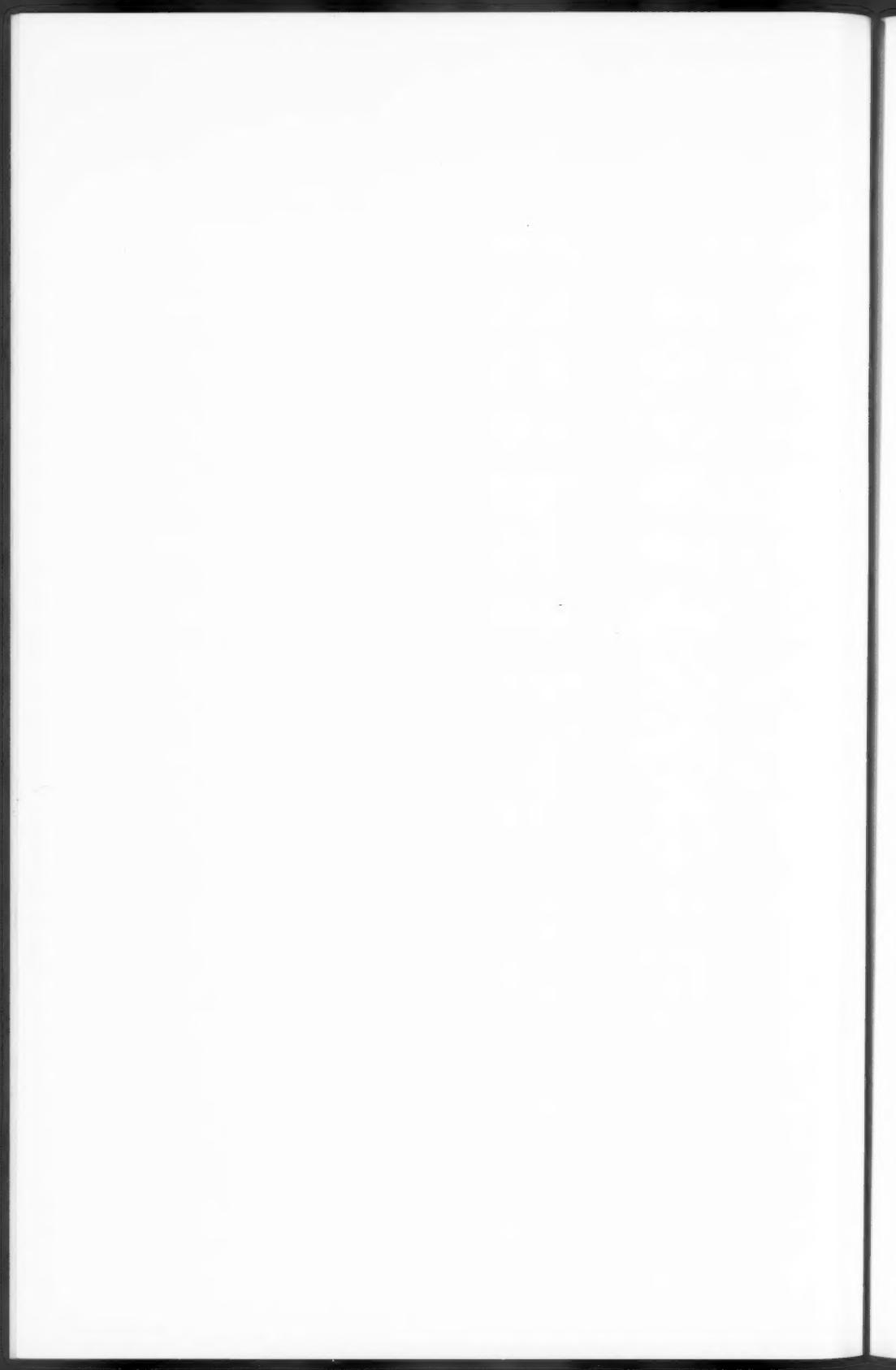
Mr. Watson Turner had referred to the importance of clinical observation and X-ray examination of teeth. He (Sir William) agreed with what he had said in that connection; also that the utmost care was necessary in extractions, and that the operation should not be hurried owing to the risk of damage to the gums. Dealing with Mr. J. G. Turner's queries, with regard to a laboratory test for streptococci, a suggestion he might offer was to prepare a vaccine and give a dose or two to a friend and see its effect. When dental sepsis was present, the immunity was likely to be broken down in the course of time, particularly if there were general depressing causes at work. As to which kind of infection

caused the worst reactions it was difficult to say. He would judge rather by the general appearance and the blood-count, etc., than by the X-ray appearances round the teeth.

He agreed with Dr. Livingston that extractions of teeth should be regarded in the same way as the giving of an inoculation. Two or three might be removed from a patient with a lowered immunity, and then an interval of two or three weeks allowed to elapse.

On the point of secondary dental sepsis, he was afraid he had failed to make himself quite clear. He had been thinking of gingivitis as a form of dental sepsis.

Mr. Bulleid had asked if dental sepsis in elderly persons was less dangerous than in younger people. He (Sir William) thought it was, though it was difficult to generalize, and each case had to be considered on its merits. In his view it was unwise to remove teeth in elderly people unless the condition was pressing. He agreed that the agglutination test was of value in assessing the immunity; and in regard to the blood-count, attention had been directed in a previous paper to the importance of a good blood-count in gauging the immunity. A low immunity was shown by a low haemoglobin percentage and a low colour index, and in severe cases this was accompanied by a leucopenia, with a diminution of polymorphonuclear leucocytes and an increase of the mononuclear in the differential count.



## Section of Urology.

[March 27, 1930.]

### Recurrent Carcinoma of Prostate: Transplantation of Ureters into Rectum.—CYRIL A. R. NITCH, M.S.

H. McC., aged 70.

*History.*—July, 1928.—Suprapubic prostatectomy. Large adenomatous prostate with small area of carcinoma in left lateral lobe. Rapid local recurrence leading to formation of a large growth in five months with dysuria and re-opening of suprapubic fistula.

November, 1928.—Transplantation of ureters by Coffey's method. Smooth convalescence, in spite of age.

March, 1930.—Can now retain urine for about five hours, and only has to rise once at night.

The growth is slowly increasing, but as yet there are no X-ray signs of metastases in the bones.

*Discussion.*—Mr. OGIER WARD said that to-night there was on view a urogram from the Miller Hospital of a patient in whom the right ureter was transplanted into the bowel. He had found a difficulty in keeping the end of the ureter in position within the rectum, and some sepsis had developed round it. A pelvic abscess developed, and after drainage of this there was a leakage of urine through the wound which eventually healed.

Later the patient had another attack of fever, but became well again. The urogram showed that the ureter was very much dilated, and the speaker wondered whether this was not of more common occurrence than was supposed.

It would be interesting to have urograms of many of the patients who had had the ureters transplanted in this fashion, to see whether they retained their normal calibre, or whether there occurred a partial obstruction at the junction with the rectum.

Mr. CLIFFORD MORSON said he had carried out this procedure only with the aid of Coffey's ureteric catheters, and he agreed with Mr. Nitch that it was an undesirable method. The difficulty of getting the catheter out of the ureter through the rectum was great, and it was dangerous. In his case extravasation had occurred, and he was sure that was due to pulling the catheter out through the rectum. He would not use these catheters again.

Mr. CYRIL NITCH (in reply) said that in two cases in which he transplanted the ureters he had used catheters, and in both of these he had been obliged to pass a vaginal speculum up the rectum and cut the ureter off the catheters. In one of the last issues of the *American Journal of Urology*, Dr. Walter, who had been using these catheters for draining ureters for pyelitis, found that the catheter swelled, except at the portion which was covered by the gold leaf on which the centimetre marks were made, and he had now had catheters made completely covered with gold leaf, and had used one for six months. But he left them in only one or two days, and the interior did not swell. In the present type of case, however, one had to leave them in for ten days, and under these circumstances a rubber tube was best.

### Papilliferous Carcinoma of Kidney and Ureter.—CYRIL A. R. NITCH, M.S.

A. M., female, aged 54. Haematuria for three years and right loin pain for one year.

Cystoscopy.—Bladder healthy; blood-stained efflux from right ureter. Pyelogram showed marked filling defect.

May, 1929.—Nephrectomy. Pelvis and calices filled with papilliferous growth invading parenchyma; microscopically carcinoma. Haematuria recommended one month after operation, but patient did not report it until five months later.

November, 1929.—Cystoscopy: Pedunculated villous papilloma above left (opposite) ureteric orifice. Disappeared after fulguration.

December, 1929.—Three small papillomata near right ureteric orifice, fulgurated.

January, 1930.—Two small papillomata on roof of bladder and one near right ureteric orifice, fulgurated.

February, 1930.—Three papillomata in right lateral wall, fulgurated.

March, 1930.—Three papillomata in base of bladder and one on lip of right ureteric orifice.

Ureterectomy through Kidd's incision and fulguration of vesical papillomata. Upper one-third of ureter was dilated and contained old blood-clot; lower two-thirds filled with papilliferous growth. Microscopically benign; a simple papilloma.

**Dissection of a Case of Diphallus.**—CHARLES DONALD, F.R.C.S.

The specimen, obtained at autopsy from an infant which died on the seventh day, showed abnormalities in the genito-urinary system of two complete penises, only one of which had a pervious urethra, and a single kidney and ureter. Atresia ani was also present.

**Specimen of Large Ureteric Calculus.**—E. W. RICHES, M.S.

*Clinical History.*—Male, aged 38. Eight years ago had stones removed from the left kidney. For one month has had attacks of left renal colic, frequency and difficulty of micturition.



Ureteric calculus: actual size. Mr. E. W. Riches' case.

On admission to the Hospital of St. John and St. Elizabeth on December 1, 1929, there was a large tender swelling in the left loin. Temperature 102°; leucocyte count 10,000. Urine contained a trace of albumin, but no pus. Blood-urea 99 mgm. %.

*Skiagram* (Dr. Duncan White).—Showed a laminated calculus in the left kidney, and a large long calculus, partially laminated, in the left side of the pelvis.

*Cystoscopy.*—Right ureter catheterized, no obstruction; left ureter obstructed at 1 cm. On repeated attempts at catheterization an efflux of pus came from the left side. After indigo-carmine (intravenous) no dye was excreted from either side after fifteen minutes. The left kidney was then explored and a large adherent pyonephrosis drained.

After operation the patient became uræmic and deeply jaundiced; the blood-urea rose to 204 mgm. %.

Five weeks after operation the urine draining from the left loin was free from pus. The urea-concentration test was satisfactory: blood-urea 42 mgm. %, but intravenous indigo-carmine was only excreted by the right kidney after thirty minutes.

The stone was then removed retroperitoneally from the pelvic part of the left ureter. The fistula in the left loin closed spontaneously four weeks later.

*Description of Stone.*—Length, 3 in.; breadth, 1½ in.; weight, 1½ oz. Consists of calcium phosphate, with some organic matter.

A skiagram of the stone shows a nucleus in the lower end, around and above which laminæ have been laid down.

*Discussion.*—Mr. CYRIL NITCH said that he had removed a calculus last summer from a patient sent to him from abroad. The stone could be felt in the right iliac fossa, and it had extended from the base of the bladder two-thirds of the way to the kidney. In order to get the stone away he had had to divide the ureter at the back of the bladder and pull the calculus out that way, then put the ureter into the upper part of the bladder again. The patient had also had a stone in the kidney at the time, but would not allow that to be operated upon. He (the speaker) had since heard that there was trouble in the kidney, which would have to be removed. That was how these calculus cases eventually ended.

Mr. KENNETH WALKER said Mr. Riches was to be congratulated on the patient's recovery from such a grave state of uremia. He (the speaker) did not think, however, that the patient was at the end of his troubles, or perhaps that the operator was at the end of his difficulties. Two years ago he (the speaker) had removed a large stone from the same situation. In a year's time there was another stone as large as the first one. When removing this later stone he had transplanted the ureter into the upper part of the bladder. Apparently all was well and he lost sight of the man. Later on, however, he had a letter from Mr. Everidge saying that this patient had come to King's College Hospital, the present trouble being a diverticulum. The end of the dilated ureter was connected with the bladder, and the question was whether this should be removed.

Mr. J. EVERIDGE said that he had cystoscoped this patient in January, 1930, and found support for the previous opinions on the case: he saw a beautiful example of a transplanted ureter, and the new ureter was acting splendidly. Below and to the right side of it was the old ureter, from which was escaping very thick pus. The skiagram showed a stone in that part. The present condition of the patient was excellent, but he had some pain, and if there was further trouble the stump of the ureter might have to be removed.

Mr. SWIFT JOLY said that the largest ureteric calculus he had seen was one 8 in. long, removed in Berlin many years ago. He did not know anything about the case either before or after the operation.

Mr. Riches had raised the point as to whether one should deal with the kidney, or deal directly with the stone, in the case of a pyonephrosis above the ureteric orifice. His (the speaker's) view was that the best treatment was to deal with the septic focus—the pyelonephrosis—first, then one could do what one wished with the stone. This subsequent dealing with the stone depended on the condition of the other kidney. If it was healthy, one should perform nephro-ureterectomy on the affected side. If the other kidney was infected it was necessary to be conservative; in that case he would then do as Mr. Riches had done—perform nephrostomy and then remove the stone.

#### Papilloma of the Pelvis of the Right Kidney, with Secondary Implantation Growth in the Corresponding Ureter.—TEMPLE MURSELL, F.R.C.S. (Johannesburg).

Patient aged 57. During 1925 he had several attacks, at intervals of two months, of profuse symptoms of haematuria. When I saw him he had large clots in the bladder, and blood was coming from the right ureter. Early in 1926 he was transferred to me from Pretoria. A pyelogram showed a filling defect in the upper two calices on the right side. The left kidney was normal. I diagnosed growth.

The kidney was removed and the patient made an excellent recovery. A year later he had slight haematuria; frequent examinations failed to locate its source. Early in 1927, as I was coming to England he came with me, and Sir John Thomson-Walker saw him with me. The patient went back, and during the latter part of 1927 he had two or three attacks of haematuria, but remained very well until the end of 1928, when he had a free hemorrhage, which was coming from the ureter. The ureter was removed and the pathologist reported papilloma, but I have a suspicion of malignancy. These growths of the urinary tract are always open to doubt when pronounced to be innocent. I wonder whether catheter interference has been the innocent cause of producing an implantation papilloma, and if so, whether one should not try to sterilize and kill the cells by alcohol or strong nitrate of silver.

### Some Examples of Excretion Urography.

By R. OGIER WARD, D.S.O., M.Ch., and  
KENNETH HERITAGE, F.R.C.S.

#### I.—Mr. Ogier Ward.

THE first of these urographic methods was tried at the Miller Hospital last November, following the method of Roseno, which is based on the idea of giving a drug opaque to X-rays, combined with one which is a diuretic, namely sodium iodide and urea. The results then obtained were not satisfactory. It was possible to see the outline of the pelvis and ureter and bladder, but the skiagrams were not good enough for accurate diagnosis.

The first slide shown is a pyelogram obtained by using a drug called "uroselectan," a more recent invention, the composition of which is not generally known, but it contains iodine in a form which is opaque to X-rays, combined with urea. It is a German preparation, the result of careful work which has been carried out by Dr. Swick and others, working in conjunction particularly with von Lichtenberg. The skiagrams obtained are really more than pyelograms and the word "urogram" is perhaps more appropriate, for the dye is excreted by the kidney, and shows the renal pelvis and the ureter and the bladder. When a patient is excreting urine freely and the ureter is unimpeded, the dye quickly collects in the bladder and gives a dense shadow; so to get a good view of the lower end of the ureter the patient should be asked to empty the bladder just before the skiagram is taken. There are four uograms of the first case, which is that of a young woman 28 years of age. In August last she had severe haematuria, which lasted two days, and then she began to get weak and looked ill, and presently all the symptoms associated with tuberculous cystitis gradually supervened. Pus, streptococci, coliform bacilli and tubercle bacilli were found in the urine. Cystoscopy showed a very acute cystitis; ureteric catheters entered but were obstructed a short distance from each ureteric opening. The urogram (fig. 1) was taken by Mr. Heritage, who injected into a vein 40 grm. of uroselectan dissolved in 100 c.c. of water, prepared according to the method advised. That was done on the X-ray table and the first picture was taken half an hour after that. It shows that the left kidney has a dilated pelvis, dilated calyces and a dilated ureter; one cannot see anything on the right side where it was hoped there might be a healthy kidney. The next urogram (fig. 2) was taken one hour after the injection and the drug is seen very well on the left side, and it shows a kink in the ureter. Still there are no shadows on the right side. The next urogram (fig. 3) was taken at four hours, and the appearances on the left are very much the same. The reason why the left kidney and its ureter are so much distended is that there was a stricture at the lower end, where it entered the bladder, and these kinks



FIG. 1.—Half an hour after injection.

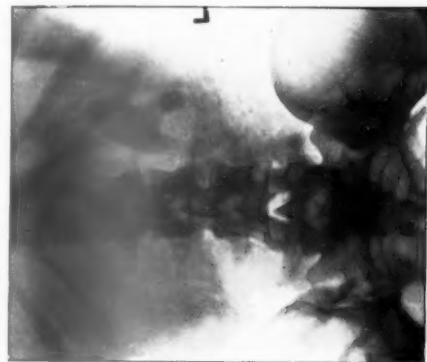


FIG. 2.—1 hour after injection.

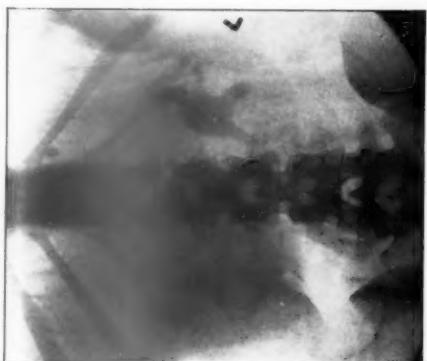


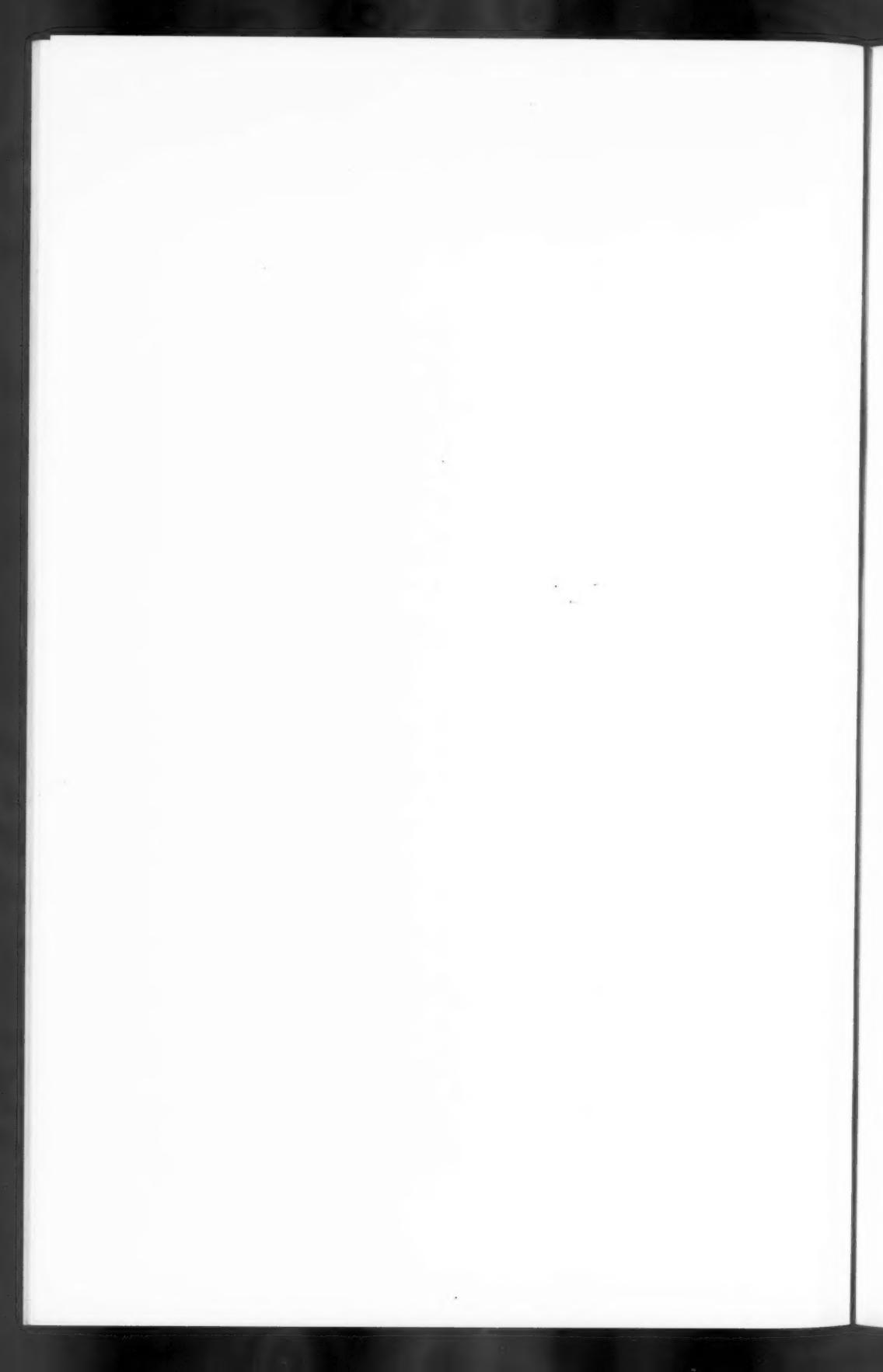
FIG. 3.—4 hours after injection.



FIG. 4.— $2\frac{1}{2}$  hours after injection.



FIG. 5.—1 hour after injection.



have been produced by violent endeavours on the part of the ureter to get rid of some of its contents; for uroselectan is not merely an X-ray-opaque body but a powerful diuretic. This latter skiagram also shows much gas in the colon, a common occurrence some hours after the administration of this drug. The diagnosis made by means of these excretion urograms was that the patient had a useless right kidney and a functioning left kidney which was obstructed. At operation the left ureter was found thickened and dilated. After trying to aspirate urine from it with a syringe and needle, it was incised, to admit a ureteric catheter; the urine from it contained tubercle bacilli and pus. On examining the ureter of the right side it was found to be diseased also. It was assumed that both kidneys were tuberculous and the right functionless.

**POSTSCRIPT.**—Since making this communication, the patient has died from generalized tuberculosis. The right kidney was found filled with dense caseous débris, and was entirely functionless. The left kidney contained a tuberculous focus, but considerable active renal tissue; the ureter was thickened and dilated.

In the next case an ordinary cystoscopic infiltration pyelogram was made in the case of a boy aged 17; it was of his right kidney and showed early hydronephrosis, which was not infected. In July last he had left-sided renal pain, with a temperature of 100° F., and the urine contained pus, blood and staphylococci. He was considered to have left pyelitis, as the urine from the left side contained pus and staphylococci.

This left kidney was grossly hydronephrotic, as was shown by the usual method of infiltrating sodium iodide through a catheter, and the indigo from this side was excreted only in 20 minutes. The urogram (fig. 4) was taken 2½ hours after the injection. On the right side, the picture obtained corresponds almost exactly with the cystoscopic infiltration pyelograms. On the left side, even 2½ hours after the injection of the drug, there is no shadow at all, and the kidney is probably a mere shell.

**POSTSCRIPT.**—This diagnosis has since been confirmed at operation.

The next two uograms (shown) are from a normal case.

The patient had merely strained his back, but thought his kidneys were affected. The first was taken 15 minutes after the injection of uroselectan, and showed a little over-filling of the pelvis, which may be due to the intense diuresis which occurs soon after the drug reaches the kidneys. The second (fig. 5) was taken half an hour later, and shows normal pelves. The optimum time for taking these pictures is half an hour after the drug has been put in. Sometimes, when there is poor excretion, it is necessary to wait a long time to get a picture, even when there is stasis in the tract below the affected kidney.

The last urogram (shown) is from the case of a boy who was recently admitted with injury to his right kidney. He had rigidity, tenderness and thickening on that side, and had haematuria. The urogram shows a normal left kidney, and in the right kidney there is a normal upper major calyx and central calyx, but the lower calyx cannot be seen. On the X-ray negative it is possible to see something which may be a little collection of the drug, forming a circle around the lowest papilla. This urogram suggests that there is a blood-clot blocking the right lower major calyx. The case is also of interest because of the dose given. That recommended for human beings is 0·66 grm. per kilogram of body weight, and for this boy, aged 8, the normal dose would be about 15 grm. He was, however, given 35 grm. and suffered no inconvenience.

## II.—Mr. Kenneth Heritage.

The method owes its origin to the happy thought of Roseno, who suggested giving a mixture of urea and sodium iodide intravenously, with a view to getting a radiographic shadow of the urinary tract, analogous to Graham's use of iodophenol-

phthalein for the gall-bladder. This method was successful but not without slight inconvenience to the patient. Swick has evolved an iodo-pyridine (uroselectan) which, whilst being excreted by the kidneys in sufficient quantity to be radio-opaque, is quite innocuous. 40 grm. is the usual dose for the average adult male, but much larger doses can be tolerated. Uroselectan is dissolved in 100 c.c. of distilled water and injected intravenously with a large syringe. No local cellulitis or reaction results, even if some does leak from the vein, so that "bad arms" such as occasionally result from tetraiodophenolphthalein need not be feared. The patient suffers no ill-effects beyond a generalized feeling of heat and a transitory thirst. We have examined the urine at frequent intervals after the injection, and although the specific gravity often rises to 1040, no irritation of the urinary tract is caused by the drug, and no aggravation of pre-existing chronic inflammatory disease results.

Skiagrams are taken of the whole urinary tract at intervals, and two valuable sets of information are obtained:—

(1) The time of appearance of the drug on each side acts as a differential test of renal efficiency. From our experience of seventeen cases, it appears that if a kidney takes more than half an hour to excrete the drug, there is probably something wrong with its excretory power. Usually the drug appears in from ten minutes to a quarter of an hour. The density of the shadow represents the balance of excretion over the emptying power of the pelvis and ureter. Increased density therefore means functioning renal tissue plus delayed emptying, and not necessarily hyperactive renal tissue. The time of appearance is the only real criterion as to function.

(2) An outline of the renal pelves, ureters and bladder is obtained, provided both kidneys retain some secretory power. If one side fails to show, that kidney is either absent or inactive, temporarily or permanently. Ureteric obstruction (stricture, stone, aberrant vessel, ureterocele, etc.) gives the best pictures. Von Lichtenberg, in a series of over 200 cases, has obtained sufficient evidence in 75% to render cystoscopic pyelography unnecessary. In impassable ureteric obstruction this method may be considered the complement of the cystoscopic method, whilst in children, in cases of urethral stricture, "thimble bladder," ureters transplanted into the rectum, etc., an intravenous method has obvious advantages.

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PLATE II. SECOND STATE.

WILLIAM HOGARTH, 1697—1764.

FURTHER to our notices in this journal of April and May, the third state of the fourth plate "THE ARREST" is not yet sufficiently advanced to show in this issue. It is hoped to show a reproduction from the plate on this page in July. Intending subscribers in the meantime, should send in their application for particulars and miniatures in colour to be sent to them, free of cost, as the edition is being very quickly subscribed, and it is anticipated that the edition will be completely subscribed before publication. We have however, shown here the second state of "THE LEVEE," plate two. The third state will be published as soon as sufficient progress has been made, and for those who are interested, miniatures in colour of the work taken from the original paintings, together with the prospectus, will be sent, free, on application, as soon as published.

Proceedings (6/6/30)

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## Section of Psychiatry.

[April 8, 1930.]

### Impressions of American Psychiatry.

By EDWARD MAPOTHER M.D., and A. A. W. PETRIE, M.D.

#### I.—Dr. E. Mapother.

IT is almost traditional to start a paper on such a topic as mine by quarrelling with the title. I propose to be traditional though I admit deliberately accepting the title proposed by the Secretary for the opportunity it gives to make two preliminary points.

My first point is complete acceptance of the term "impressions. In August and September, 1929, through the generosity of the Commonwealth Fund, I visited the United States and Canada, and was six weeks ashore. The itinerary devised to suit my generalized purpose included visits to ten principal cities containing large Universities in ten of the United States, and to Toronto and Montreal as comparable cities representing two of the provinces of Canada. These cities represented only those lying along the Atlantic coast as far south as Washington (which is practically the border town between the Northern and the Southern States), and those of the United States and Canada lying in a fairly straight line along the Great Lakes as far West as Chicago. Obviously the States and Provinces which I sampled, represented only a trifling fraction of the area of the United States and Canada. But the total population of these States and Provinces is well over 50 millions, while the total population of the cities visited is over 15 millions. Moreover, anyone who has followed the itinerary which was devised for me can claim to have sampled those cities and States where most (though certainly not all) of the most interesting psychiatric activities of the Continent are concentrated.

In virtue of the courtesy and hospitality which I received through the influence of the Commonwealth Fund and through the wonderful traditions of America in such matters, I had arranged for me in six weeks, seventy-five interviews with administrators or visits to institutions. Without assuming any credit I can therefore claim to have had a bird's-eye view of a large section of American Psychiatry presented to me.

I know quite well that the mental cookery following such an intake is likely to be disturbed. Nevertheless, I think in such a paper as this some generalizations—even half-baked ones—are likely to have more nutritive value than a psychiatric Baedeker, even if this were starred in the usual fashion.

I have drafted a classified list of persons interviewed and places visited in different connections, in case this might be of any use to anyone visiting U.S.A., but I shall make no further reference to that here. I hope to publish elsewhere a rather more detailed consideration of some aspects of the American situation.

Next I come to the only objection I have to the title "Impressions of American Psychiatry," viz., that there is no such thing as American psychiatry any more than there is an entity called European psychiatry, including that of Britain and Bulgaria. In deference to Bulgarian psychiatry, I hasten to say that I only couple the names of Britain and Bulgaria as extremes of distance within Europe and not for a moment as representing extremes of progress. But it is fundamental to understand that there is no less independence and no less variation in maturity of psychiatry between American than between European States. There is no federal unity whatever in this matter. Psychiatric arrangements of every kind represent forty-eight entirely

separate experiments. No general law exists and there is nothing official which is comparable to the Board of Control as a national and standardizing agency. The same is true as regards the Provinces of Canada. The nearest approaches to any unifying organizations are the National Committees of Mental Hygiene, which though supported by voluntary funds, have been asked to undertake surveys of the situation and the requirements in various States and Provinces, and which endeavour by propaganda everywhere to raise the standards of care, treatment, education and research.

In some ways, unofficial bodies, such as these National Committees of Mental Hygiene, if of good repute, have advantages over organizations like the Board of Control. Their appreciation of situations may be more comprehensive than the routine ones of the official bodies because they more readily get access to places out of the official orbit and they are able to express their real views and say what is needed, just because their statements have no official consequences. Hence they are not obliged to defer to the political and financial situation of the moment. Nothing is more badly wanted in England now than an organization really corresponding to the National Committees of Mental Hygiene, in America and Canada.

The purpose of my visit was not to see a truly representative sample in a critical spirit. I was admittedly out to see all that was best and most interesting—the "high spots" as they are called locally. Therefore any generalizations which I may venture apply only to what I saw, and for the most part to psychiatry in America at its best. Only in special conditions shall I refer to what seem backward arrangements. I shall make no criticism of American arrangements that is not really a quotation of expert opinion there.

I want specially to emphasize the topical features of American psychiatry. The Mental Treatment Bill seems likely to be this generation's contribution to progress or reaction. It has reached a fairly definite form now. There are many points about American arrangements which throw a flood of light on the situation foreshadowed by the Bill. I know of no evidence that American arrangements have been considered before drafting: this would probably be contrary to tradition. I must also say that in the part of America which I visited I saw an amount of psychiatric research in progress that one could not possibly equal in a similar tour of Great Britain. I do not profess to estimate the ultimate importance of anything I saw. Results that really make a difference are of course the product of a very few minds in each generation. As to opportunities for solid, steady contribution to knowledge, America is incomparably ahead. One can usefully discuss in a cursory way such opportunities though not achievement.

Passing from preliminary discussion to impressions, it appeared to me that the outstanding differences of psychiatry in America included four factors and one main resultant. The four factors were as follows: (1) The enormously rapid growth of population. (2) The extent to which official psychiatric provisions at public expense are supplemented by bequests, donations, and above all, grants from such sources as the Commonwealth Fund and the Rockefeller Foundation. (3) The degree in which the American psychiatrist is master in his own house—a degree which is unthinkable in our lawyer-ridden land. (4) The far wider diffusion and the much higher level of psychiatric education of all kinds in America. The main resultant of these factors is the greater tendency in America to look upon the existence of mental disorder as a problem to be solved rather than a burden to be borne. The rest of my paper will be devoted to amplifying evidence concerning these factors and this resultant.

(1) Rapid growth of population means that institutional provisions, at least for mental disorder, tend always to be in arrears. Results are good, bad, and doubtful.

*Good Results.*—In general it may be said that the shortage reduces stereotypy. It affords frequent opportunities for embodiment of new thought by addition of new institutions and of new features to old ones. It promotes a tendency to try legitimate

substitutes for institutional treatment and even to expend money on attempts at prevention and cure. Among the many excellent things that have largely resulted from institutional shortage are the extramural activities of the State Hospitals and State Schools. The Clinics based on these institutions deal largely with cases of mental disorder and mental defect in which the patients, under supervision, are able to stay at large, whether after a period in a State hospital or without this.

*Bad Results.*—Among these are : (a) Overcrowding, almost everywhere. (b) The need in some places, to treat many cases of transient and incipient psychosis in the city gaol. (c) Discharge of patients in some places by lay and legal authority in disregard of Medical Superintendent's opinion, to make room. (d) A tendency in some places to reserve institutions for the worst and most antisocial cases of both mental disorder and mental deficiency. (e) Delay in providing public hospitals for minor cases of both conditions ; this is usually rationalized by a general claim to have discovered the fallacy of early treatment.

In Massachusetts—the most progressive State—mental deficiency institutions are unclassified, unlike those of London, anyhow. Massachusetts is interesting and logical, at least in that it justifies the mixed institutions for mental defectives by the very same arguments that in London are thought to justify mixed mental hospitals, arguments which do not prevent mental deficiency institutions here being graded.

*Doubtful Results.*—Among the tendencies due to institutional shortages which are doubtful, is the very high proportion of cases of both mental deficiency and insanity which are on parole with friends, e.g., nearly 5,000 out of 45,000 insane, for whom New York State is responsible at any given time.

It is doubt of the consequence of this system from the eugenic standpoint, even when coupled with extramural supervision, that is probably responsible for the legislation which, in twelve States, combines sterilization with probation and supervision. I do not intend that my indiscretion shall go to the length of discussing sterilization here.

(2) The second factor in promoting the progress of American psychiatry is the extent to which it has been fostered by bequests, donations, and especially by the continuing generosity of the Commonwealth Fund and the Rockefeller Foundations. Much is due to the enlightenment with which this generosity has been applied ; the wise use of these funds is the ideal corrective for the politician's tendency to think, financially, with reference to the next election rather than to the next generation. In most places in America, State provision has perhaps necessarily concentrated on the worst cases of mental disorder and mental defect. The Commonwealth Fund and the Rockefeller Foundation, collaborating largely with the National Committees of Mental Hygiene of America and of Canada, have concentrated on a triple programme :—

(i) Promotion of the advanced training of psychiatrists and of research, by the grant of fellowships at centres like the Phipps Psychiatric Clinic and the Boston Psychopathic Hospital.

(ii) A programme of prophylaxis and of early treatment of minor divergences by means of out-patient clinics and of propaganda. As regards adults, one of the most striking movements is the provision of mental hygiene facilities at the universities as part of the health service which is a recognized provision for undergraduates.

(iii) The greatest development which owes its growth, though not its birth, to private generosity, is the Child Guidance Movement. This has been discussed so lately by the Section at a joint meeting with the Section for the Study of Disease in Children,<sup>1</sup> that I propose to say nothing here except that there can really be no doubt about its influence in, at least, reducing unhappiness during childhood, and in averting the anomalies of character that are continuous with definite neurosis

<sup>1</sup> *Proceedings*, 1930, xxiii, 573.

and with criminality. These foundations in America have always observed the wise principle that the rôle of private endowment is to give a start to promising novelties and to insist that when a given service has proved its case as a need of the community, then the time has come for the community to provide that service and to finance it locally whether by taxation or by voluntary contributions. It may be rank heresy, but the policy of the American foundations leaves me wondering whether progress might not be faster in this country if private generosity could be directed more to new ventures and less to established institutions (such as voluntary hospitals without medical schools to justify them). These would inevitably exist as a public service if not privately supported.

Despite all that psychiatry owes to the major foundations of America, I want to stress the fact that our national shortage of millionaires is not a complete excuse for the gap between the best organizations in America and the best in England. Anyone who doubts the gap should make a careful study of the whole system under the Department of Mental Diseases for the State of Massachusetts, including its provision for research. This system owes comparatively little to private benefactions. The Institute of Juvenile Research in Chicago is also a splendid organization for Child Psychiatry, supported wholly by the state of Illinois.

(3) The emancipation of the psychiatrist, the replacement of the static mind of the lawyer by expert knowledge in control, is the great guarantee of the future in America. This transfer of control is most complete in the most highly organized and most progressive States such as Massachusetts and New York, and all tendency to question it, even by lawyers, seems to have disappeared. Before detailing the way in which the psychiatrist in America has secured the management of what are indisputably his own affairs (i.e., arrangements for the neurotic and psychotic), one may just refer to the way in which he is getting a voice in dealing with another form of mental disorder, viz., criminality.

In Detroit there is attached to the Recorder's Court (handling nearly 10,000 felonies and 30,000 misdemeanours a year) a complete psychopathic clinic with two psychiatrists and a group of social workers and psychologists. To this clinic about 1,000 cases per annum are referred, felonies and misdemeanours in about the ratio of their occurrence. The reference may be:

(a) Before trial, as to responsibility. (b) After trial and before sentence, whether this sentence should be commitment to prison or reformatory and, if so, for how long; or on the other hand should be probation with supervision. (c) For guidance as to problems arising while on probation.

The Court follows the Clinic's recommendation in nearly 90 per cent. of reference cases. Any difference consists almost wholly in the Court taking less severe courses than those recommended by the psychiatrist. This is a good answer to the view that asking the psychiatrist means coddling the criminal. Ninety per cent. of cases where probation is advised by the psychiatrist keep straight during this. The general usefulness of such reference is shown by the fact that even offences in connection with driving motor cars are found to have clear correlation with mental disorder; I rejoice to say they are not pathognomonic. Similar arrangements exist at Cleveland, Ohio. Here the psychiatrist was not a whole-time officer of the Court when I visited, but it was being considered that he should become so, since of all cases coming before the Court a large proportion were referred to him.

Next, one should note that in the two most advanced States of America, the commissioner at the head of the department of correction is a psychiatrist. This department is responsible, under the Governor, for all penal arrangements, as is the Home Office in England. In the State of Maryland the Commissioner for Mental Diseases has authority to transfer any person from prison to a mental hospital—which constitutes an absolute power to adjust punishment except that of death. Nobody seems inclined to question these arrangements.

Passing to arrangements for prevention and care of neuroses and psychoses—those mental disorders which are universally accepted as such—one should first note the arrangements for the future in England which will follow the Mental Treatment Bill. Hitherto the medical element of the Board of Control has been equal to the legal and lay. Hereafter it is only secure that one of the "Big Five" who are to settle all policy shall be a doctor. A proposal that he should necessarily be a psychiatrist was negatived by the Select Committee of the House of Commons. The position of the only other doctors connected with this new Board of Control was neatly summarized by the statement that they were to be the servants or alternatively the hands and eyes of the "Big Five"—who presumably will combine the functions of brain and mouth.

With this may be compared the position in the most advanced States of America—Massachusetts and New York. Here all psychiatric provision and supervision are entirely in the hands of a State Department. There is no triplication of function as hitherto between Board of Control, County Council and Guardians, or even duplication as now, between Local Authority and Board of Control. There is a simplification which may be roughly compared to that which would exist if all public provisions for psychiatry had to the Board of Control the relation which Rampton now has. In other words, the State Department is responsible for everything; in respect of public institutions, for all rules, supervision, management, and obtaining from the legislature the necessary funds for provision and for maintenance; and in respect of private institutions, for rules and supervision. But over this Department for Mental Diseases is a permanent head—the Commissioner—with powers far exceeding, in every way, those of the Board of Control, having direct access to the Governor of the State without intervention of any Minister or other politician and, through him, access to the legislature.

It is definitely laid down by law that the Commissioner shall be not only a doctor but a psychiatrist, with at least five years' institutional experience, and though nominally his tenure may cease with that of a particular Government, in practice it is permanent. The progressive States of America no longer make political appointments to such posts, or attempt to influence the decisions of the psychiatrists who hold them by political considerations. America has also discarded the system whereby the senior civil servant desiring such promotion is thought fit to direct the activities of the State in respect of psychiatry, when a vacancy occurs, regardless of previous knowledge or experience of the subject! In America, such appointments now only occur as examples of corruption in backward States. On the best authority, I understand that in practice the Governor and the Legislature in American States consider that their province is limited to deciding how much can be appropriated for new projects of the Department, and whether the general financial situation permits of finding the money needed for the proposals advocated by the Commissioner of Mental Diseases. Apparently, detail is left to him entirely, and even the order of priority of his proposals. With this may be compared, by those with time to spare, the official reports of the discussion upon the Mental Treatment Bill. America has apparently lost our English faith in settlement of technical detail by the inexpert.

Within the Department of Mental Diseases in Massachusetts there is no lawyer, except one concerned in recovery of contributions due from relatives of patients. There is no layman except the woman at the head of the Social Service Division, the assistant commissioners and the heads of all other divisions are psychiatrists. Of these the commissioner is chief, with almost autocratic powers in reserve. His immediate subordinates—each in charge of a division of the department—are what we should call in England "Deputy Medical Superintendents," seconded to headquarters. On occurrence of a vacancy as Medical Superintendent, one of the assistant commissioners goes back to run the mental hospital, another deputy-superintendent comes up to headquarters. Every month in Boston a dinner is held

(subject to the 18th Amendment), and attended by all the superintendents and all the assistant commissioners, with the Commissioner in the chair. At this, free discussion of official matters is encouraged. The whole scheme seems ideally adapted to reduce to a minimum the gap between regulations and reason constituting the "headquarter spirit" with which so many of us first became familiar in the war.

*The Fourth Factor.*—The fourth factor in the American situation is the extraordinary difference between psychiatric education of all kinds there and here. The education of the public has reached a point at which the man and woman in the street know about the existence of mental hygiene services, and are prepared to utilize these for their children and even for themselves.

One of the most interesting educational projects in America—a counter-blast to excessive specialism—is the foundation of the "Institute of Human Relations" at Yale. Here it is intended that as the preliminary of their professional training, the future doctor, lawyer, clergyman and others whose business is the handling of people, shall get a common grounding in at least the elements of biology, physiology and psychology, including among the practical derivatives of psychology, sociology and some psychiatry. It is intended to make of this psychobiology an essential common groundwork, almost as we build on a foundation of dead languages.

As to pre-graduate medical education in psychiatry, there is here no university or medical school which approaches in thoroughness that which is universal in at least ten American universities. In these universities comprehensive courses are given in each of four years of medical training—a real grounding in medical psychology and psychopathology in clinical psychiatry by lectures and demonstrations, and in personal study of patients by allocation of definite cases of neurosis and psychosis, but above all by direction of attention to the psychiatric aspect of those illnesses seen in the ordinary wards and clinics. In Columbia the position reached is that as much time is devoted to study of psychiatry as to that of each of the other major subjects—medicine, surgery, and gynecology. Since quite similar situations exist in Germany and Holland and in progressive European countries generally, it seems doubtful whether the thinly veiled pride which the run of English practitioners take in their ignorance of psychiatry is really referable to our genius for practicality.

There has hitherto been no diploma in psychological medicine in America, but I know that Professor Adolf Meyer is interested in the institution of such a diploma, possibly one in each State, with equal standards.

For acquisition of technique from those actively engaged in various branches of research, and for really advanced teaching, American psychiatrists have of late years mainly gone to Vienna, except in respect of neurology, for which all say the National Hospital, Queen's Square, is the best centre in Europe. In view of the staffing and facilities which will be available in the three psychiatric institutes to open shortly—those in New York, connected with Columbia and Cornell Universities, and that at Philadelphia—the current may well soon flow the other way.

As to the training of mental nurses in America, most of the ideals held up by the Committee appointed by the Board of Control are realities somewhere. The State of New York is enforcing, as a preliminary requisite of nursing, a high school education until the age of 18, the inclusion of general training in the mental nurses' course, and conversely the mental training of both pre-graduate and post-graduate general nurses. All these are common-place.

My impression as to the general differences representing the resultant of the four factors which I have emphasized was as follows: As to psychiatry America is interested chiefly in progress, England in maintenance. American attention is fixed mainly on what *will be*, and English on what *has been*. American arrangements often seem unfinished, like everything that is growing, occasionally crude enough to offer an easy target to the scoffer. But efforts limited to maintaining the standards

of the past, in psychiatry as in everything, are apt to fail both relatively and absolutely, and fixation is likely to be followed by regression.

In respect of actual structure and maintenance of those types of public institutions which exist in England and of amenities there for patients, I doubt whether America has much that clearly outstrips the best in England. In such respects the most striking places which I saw were Bloomingdale, near New York—what we should call a registered hospital—and a hospital at Northampton, Massachusetts, run by the Veterans Bureau (or Ministry of Pensions).

If one compares the general maintenance cost of institutions in the States of New York or of Massachusetts with the cost in London, and pays due regard to cost of living in the two countries, then probably one finds little evidence of higher level maintenance in America.

#### *Voluntary Treatment in State Hospitals.*

Owing to the wide extramural activities in American State Hospitals, these are much less suspected than their equivalents in England. But though provision for treatment of voluntary patients in the State Hospitals of Massachusetts and New York has existed for many years, the public response is negligible.

In Massachusetts there are practically no voluntary boarders. In New York out of 45,000 State-aided patients, 652 were voluntary. In New York Hospitals in 1927 there were 11,500 admissions. Of these, 5 per cent. were voluntary. Of this 5 per cent., one half were recurrent; of the other half the great majority would otherwise have been there under certificate, while most of the minority belonged to the "hobo" class. This is an illuminating commentary on the Mental Treatment Bill. Clauses 1 to 4, especially when coupled with reassurances given by the Minister of Health to anxious representatives of local authorities that no new expenditure or new building need be feared—that what is intended is treatment of the same types in the same buildings by the same staffs with different formalities. It has been said that if private patients in large numbers will voluntarily enter such an institution as the "Retreat," where some other patients are certified, then the poorer classes will resort to the County Mental Hospitals as voluntary patients when this is permitted. American experience shows this to be an utterly false analogy. Such private institutions as Bloomingdale have 70 per cent. of voluntary admissions nowadays—the State hospitals practically none in any real sense. In fact, owing to widespread possession of means enough to pay for a time the cost of treatment outside a State hospital, these American registered hospitals are rapidly becoming the places at which all but the very poor are treated for incipient and transient psychoses.

The actual position is that public provision for the voluntary case by the State is as yet almost as defective in America as in England. The only wholly voluntary institution comparable to the Maudsley is the Phipps Psychiatric Clinic. This is splendid but it is neither State supported nor does it provide in any considerable measure for the poor. Both these remarks apply equally, I believe, to the forthcoming Psychiatric Clinic at Philadelphia and that connected with Cornell University, New York. The other, connected with Columbia University and located in the medical centre, New York, may be more analogous to the Maudsley. As to outpatient departments, three seemed most striking—those of the Phipps, of Boston Psychopathic, and that at Cornell Clinic, New York. This last is run in a general hospital like various departments of the kinds in London but on a paying basis more like that of the Tavistock Clinic, and is well organized and flourishing. As to hospitals undertaking initial observation and treatment of psychosis under temporary detention orders, these are usually managed by the city authorities, whilst hospitals for more prolonged care are maintained by the State.

The Boston Psychopathic Hospital, closely connected with Harvard University by the State of Massachusetts, is exceptional in this as in all else. But splendid as

it is, and negligible as are the formalities attending commitment here, the fact that involuntary detention exists in this State institution determines that there are few voluntary admissions. This suggests how little importance the public will attach to any difference about admission under Clause 5 of the Mental Treatment Bill. Formalities are reduced at the Boston Psychopathic far below the point proposed by Clause 5; where any patients are detained against their will this reduction makes no difference in the public attitude.

The City Psychopathic Hospitals in many cases have university connections and useful functions in teaching. From the standpoint of the patient I gathered that their repute was not high. Of the Belle Vue in New York it is fairer not to speak since it has been decided to abandon and replace the psychiatric part of this. Others that I saw seem better than most London observation wards, but far from ideal. They were mostly constructed of glass, metal tiles and concrete in what has been called "the neo-lavatorial style of architecture." The ease with which they can be washed down with a hose doubtless admirably adapts them to their special function, but it is difficult to reconcile them with a homelike atmosphere.

It is not better buildings or maintenance that constitute the real distinctions of American psychiatry as compared with English; it is the medical spirit by which American psychiatry is dominated, and the constant pre-occupation with treatment and research. An outstanding feature of all American institutions is the number of doctors. Saint Elizabeth's Hospital, Washington, with over 4,000 patients, has 40 doctors, and Dr. White reckons the right proportion to be one doctor per 100 patients.

Elsewhere the proportion accepted is 1 per 150 and 1 per 50 admissions per month. This ratio is just double the number of medical officers in all London hospitals. In reality the amount of medical work possible is much greater owing to reduction of clerical work by the use of dictaphones, stenographers, etc. Scientific work is encouraged by establishment just below the superintendency, of three equal positions—that of administrative assistant, clinical director and pathologist—each providing a satisfactory career. The medical superintendents of the most notable State hospitals have teaching positions. All the junior staff are stimulated, not forbidden, to form connections with other hospitals outside.

In spite of this, in America, as in England, there is difficulty in getting doctors of the best quality to take up psychiatry. This exists even in the schools where teaching is best; staff vacancies are not readily filled from the universities with which the psychiatric clinics are connected and candidates have to be sought outside. To some extent the difficulties are declining as the repute of psychiatry grows. But one which remains is creditable to the moderation of the medical profession in view of its control of the situation. Though the numbers of medical officers are high, salaries are low; they seemed on the average to be little higher than in England. Considering the general scale of American incomes, I think this clearly means a relatively lower financial status. It is a pity if this should prevent advantage being taken of the splendid opportunities which exist.

Judged by the standard of recent achievement, psychiatry in America is probably on the whole the equal of that in any country of the world, but it is very uneven in all respects. Hardly anywhere is everything all that one might fancy, but somewhere every improvement that we are merely talking about is in working order, serving as the little leaven that leavens the whole mass. America, like every country, has its cranks, but the people who are directing the development of its psychiatry are not cranks. They have the national readiness to try anything once, but to me they seem to be neither credulous nor given to making claims. In fact, they seemed full of the enthusiasm, without illusions, that is the true scientific spirit. I have had glimpses of the psychiatry of ten European countries. I think the future is more secure in America than in any other country because it is rooted in the four factors

of which I spoke. Lastly, in view of the respective estimates of British and American psychiatry prevalent outside the two countries, there is little room for that complacent tolerance towards the enthusiasms and efforts of others which is apt to pass for humorous wisdom in England and seems so maddening to all the other nations of the earth. Those who can may hope that the leadership which has produced the Mental Treatment Bill as it is, will somehow secure the expensive supplementary arrangements which alone will make it more than fooling about formalities. Others may hope that, if an opportunity for real progress is given to the next generation, it may be based on knowledge of arrangements actually working elsewhere, rather than on lawyers' bogies subtly evolved from the inner consciousness.

## II.—Dr. A. A. W. Petrie.

The accuracy of the tourist's impressions is notoriously fallacious, and that is particularly so when a great variety of activities of a somewhat divergent order is seen. Personally I went to America to learn, and to look for useful suggestions. I was therefore less on the outlook for imperfections. I set out with a fair number of the usual insular prejudices and I returned with a number of these ideas distinctly modified.

In viewing any similar system elsewhere, some things appear as advantages, some as disadvantages, some as merely doing things differently. Further, even in Canada and the U.S.A., some differences merely reflect the different normal habits of the people.

The cafeteria or self-service system illustrates this. This is a natural development in a country where labour is very highly remunerated. It has distinct advantages in mental institutions, as by providing choice it diminishes waste. It is, however, difficult to introduce in a country in which sane people are unfamiliar with it. Similarly, since electricity has superseded gas in America, it is adapted for many purposes such as cooking, for which gas is used here.

*Mental Hospitals.*—In discussing these various activities, I will first deal with the mental hospitals.

The chronic patients in the large State hospitals are no better dealt with than in England. Their feeding was much the same, with a possible improvement in the evening meal. Overcrowding existed in many places, although, especially in New England, the original standard of space was fairly high. The chronic sections in the Chicago area and in Manhattan, New York, were noticeably overcrowded. This fact was appreciated and new building was taking place. Probably more overcrowding has been allowed than would be permitted here, owing to the fact that the unit of administration is the State, which is its own critic, and is not subjected to inspection and report by an outside body such as the Board of Control. To counterbalance this is the advantage that the office of the Commissioner is part and parcel of the service, and there is free interchange of senior medical officers with the assistants in the State department.

The new admission hospital sections impressed me favourably. A "diagnostic corridor" with rooms fitted for all the various consultants, permitted them to see their patients under good conditions. The huge size of many of the State hospitals renders such complete arrangements easily possible.

The newer separate medical and surgical buildings are good, and together with admission buildings provide an easy method of modernizing old hospitals.

Electrical equipment is generally good, and rather in advance of that in corresponding institutions in England. Hydrotherapy is extensively practised and is good, but both the bath fittings and warm pack methods would count as restraint in England. Particularly in those States in which mechanical restraint is discouraged or forbidden, the ability to pin a patient up completely in a hot pack or to place him

in a continuous hot bath with a stout canvas cover which cannot easily be lifted, accounts for the common statement that padded rooms are unnecessary and archaic.

The staffing arrangements appear similar to those here but the nursing staff is divided sharply into "nurses" and "attendants," according to their preliminary education. As a complete instead of partial secondary education is now being demanded for nurses, this will increase the difficulties in obtaining them and probably result in some training for attendants being adopted. At present mental nurses go for from six to fifteen months for obstetrics, children's diseases and surgery, to the affiliated general hospitals, and then, on passing the State examinations, obtain the ordinary training certificate of the State. While such complete reciprocity will probably never come in England, one usually finds here the other extreme, namely, the complete ignoring of any mental training. The connection in regard to nursing staff between the general hospital and the mental hospital is also maintained by nurses from the general hospitals coming for three months' training to the mental hospital. Similar arrangements are of course in vogue in Scotland.

Although no definite course for teaching young medical staff has been evolved, such as the courses for the Diploma in Psychological Medicine, much attention has been given to providing good conditions such as adequate medical libraries. At St. Elizabeth's Hospital in Washington, there are over 11,000 books, well indexed, apart from a large range of periodicals.

The position of a clinical psychiatrist or clinical director is important, as he instructs the nurses and his junior colleagues. The position ranks equal to that of Deputy Medical Superintendent, and is usually on the same footing as that of the pathologist. He teaches, directs and co-ordinates treatment and often becomes a university teacher. The position is as a rule filled by competition, and this ensures that all the treatment is in the hands of an alert, able man, and that an adequate supply of trained teachers is provided for the numerous universities and medical schools. The position supplements the work of the divisional officers, who in America, as in England, control the workings of the male and female sides.

The arrangements for the clinical records are usually good, and dictaphones and other office refinements are used. Occupational therapy generally is good and well-developed, and gymnasium classes are more general than here. Beauty parlours and hairdressing shops have their place in keeping up the self-respect of the patients.

Sense-training classes for deteriorated cases of dementia praecox are important. These have been imitated from the sense-training classes for low grade imbeciles. In each case it results in cases which have reached a low instinctive level and are faulty in habits being trained to be useful in an elementary manner.

Out-patient departments are generally run in connection with the American Mental Hospitals. This is reckoned an advantage, not merely from the point of view of the patient, but also because it keeps the medical staff in touch with the early phases of disease. Such out-patient departments are generally run at near-by general hospitals. In the reception units and clinics in the cities, the out-patient department is always in the hospital itself. Efforts are made to serve isolated districts by sending teams of workers to conduct an occasional out-patient clinic in such areas. Generally, however, most of the cases are seen in the regular centres.

A considerable amount of this work is in connection with the extended trial or parole given to the patients. This may last up to a year, and the patient reports as often as is necessary, the intervals varying from once a week up to three months. This gives a longer time to see if the patient has adjusted to external life, but involves much more work and organized social service. Vesting the power of granting trial or discharge directly in the hands of the medical superintendent appears an advantage, and such decisions are usually reached at the staff conferences which are so generally popular there. This appears to work satisfactorily as regards the recovered, and those of whose discharge—whether as improved

or not improved—the medical superintendent approves. Where the medical superintendent opposes the discharge, the Habeas Corpus Act appears to be invoked in some cases. Certainly in the case of poor persons the English system of having the visiting committee deciding in such cases appears to be more satisfactory. When the patient is discharged otherwise than as recovered, the principle of imposing legal disabilities on discharge unless the medical officer certifies this to be unnecessary, seems logical and reasonable, and an improvement on the English practice, but unfortunately, where this occurs, the patient has just to cross to the next State to evade any such restrictions.

*Terms of Commitment.*—These vary in the different States, but are generally not dissimilar to those practised in England, and temporary observation is permitted for from ten to thirty days. Several States have voluntary clauses, but owing to the overcrowded condition of the mental hospitals, few cases are received in the public or State institutions on this basis. Twelve and a half per cent. of the 400 admissions at Whitby, Ontario, were received as voluntary patients, and the numbers so received in Boston and New York were distinctly lower. On the other hand, at Bloomingdale, New York, a wealthy foundation for private patients, 70 per cent. of the patients were received as voluntary cases. In corresponding hospitals in England a fair proportion of people are voluntary, and it will be interesting to see, with the new Mental Treatment Bill, if more use is made of the voluntary clauses for public hospital patients than has occurred in America.

The social workers' service appears well organized in individual hospitals, and in New York and New England it is organized in relation to the State service as a whole. Considerable useful work is done, much of which is covered in England by the After-Care Association, and similar voluntary organizations. Both systems have some advantages, but having the service organized from the mental hospital appears to bring the latter into closer touch with the causal and after-care problems.

The size of hospitals has been much debated, and opinions range between regarding 2,000, 4,000 and 10,000 as the ideal size; 2,000 is the general limit in the progressive State of Massachusetts, and this is probably a wise unit. Dr. W. A. White, who has built up a remarkable aggregation at Washington, advocates 4,000, but the late Dr. Floyd Haviland, who controlled 6,700 odd patients at Manhattan, New York, definitely stated that the large hospitals increased accidents and lowered the recovery rate. Dr. Haviland's obvious capacity left no doubt as to his ability to administer these large numbers in as satisfactory a manner as was possible. This opinion against these larger figures which are advocated by the laity and big business men, is impressive. As stated, it allows good medical and surgical facilities at a proportionately small cost, but there tends to be a lack of any personal touch with the patients, and the success of the institution depends greatly upon subordinates.

*Psychopathic Hospitals.*—The great development in Canada and the United States of these hospitals represents the most notable advance that has been made over English psychiatry. They can be divided into reception units, replacing the observation wards familiar in England, and clinics selecting their own cases on the lines of the Maudsley Hospital.

Toronto, Chicago and Boston each have psychopathic hospitals which act as reception units for their respective cities, and New York has plans for a similar building to replace the present observation wards.

The famous Phipps Clinic at Baltimore is attached to the Johns Hopkins Hospital and is a voluntary clinic selecting its own patients. Similar clinics are arising at Philadelphia and New York. The first of these is in connection with the department of mental and nervous diseases of the Pennsylvania hospital, and the latter is run by the New York State mental department.

The Phipps Clinic is quite small but well-fitted, and organized for teaching. The length of residence of each case is rather less than two months, as 394 admissions

are dealt with annually in 60 beds. The results of treatment which are given are obviously very conservative, as only 20 per cent. are returned as "cured," 7 per cent. as "greatly improved," and 36 per cent. "improved"; 29 per cent. are given "unimproved" (mainly certified) and 8 per cent. "not treated." The costs are about £10 weekly. The high cost of staff accounts for much of this expense, as in most U.S.A. institutions. This hospital obviously owes much to the great personality of its chief, Dr. Adolph Meyer.

The Psychiatric Institute just opened in New York, near the Presbyterian and Columbia University, is a fine building and seems likely to become a notable centre. It is close to the Neurological Unit of the Presbyterian Hospital and will be run in close association with this hospital. It is likely that it will receive voluntary patients on similar lines to the Maudsley Hospital.

The Mental and Nervous Department of the Pennsylvania Hospital is really a wealthy foundation like Bethlem Royal Hospital, with its own separate endowments. It is now converting part of its original site into a first-class clinic for voluntary patients with an ample out-patient department. The cases requiring longer treatment, and certified cases, are to be dealt with on a new estate well outside the city. The funds for this have been readily obtained by selling a portion of the valuable land of the hospital in the heart of the city. The out-patient department has been functioning for some years and appears quite successful.

Coming to the hospitals which function as reception units, the oldest and most complete is that under Dr. McFie Campbell, at Boston. There are 126 beds and 20 medical staff. It is notable that the out-patient department at this hospital deals with quite as many cases of this type as those seen in the Boston General Hospital. About 200 in-patient cases are dealt with monthly, which gives an indication of the pressure of work. Despite this, it forms an important teaching and research centre.

The Chicago Psychiatric Hospital has 175 beds and deals annually with from 5,300 to 5,600 patients (more than one hundred per week). There are only two paid assistants to the superintendent, but eight unpaid psychiatrists work here in return for teaching facilities. Despite the great pressure of work, time is found for investigation and treatment. An obvious deficiency is the absence of an out-patient department.

The Toronto Psychopathic Hospital, under Professor Farrar, has 60 beds and an out-patient department. It receives cases brought in by the police, cases referred for observation by their doctor, and cases taken in from the out-patient section, and it appears to function well.

These units all seem to be developments on the right lines, and when the new 600-bed unit is built in New York, it is likely to become one of the notable centres. No one doubts the importance of clinics for voluntary patients, but the adequate dealing with those early cases which require enforced observation is also a most important question.

The Mental Deficiency Schools at Letchworth and Wrentham are built on the villa or colony principle, and both impress one as being run on sensible practical lines.

Various "Child Guidance" movements were seen. These schemes have often developed from the study of child delinquency. The centre at Chicago under Dr. Hermann Adler has developed into a neuropsychiatric and research centre. An interesting environmental study worked out by the sociologist shows that the dense area around the business quarter has supplied the bulk of the crime, when successively occupied by the Scandinavians, Irish and Germans, later by the Poles and Italians, and lastly by Negroes. Each group as it has become more prosperous has moved out and has improved in its habits. A most comprehensive scheme of study in regard to children of all ages is being developed under Professor Bott of Toronto.

The Institute of Human Relations which is being organized by Dr. Winternitz at Yale will absorb the well-known Gessell clinic and other activities.

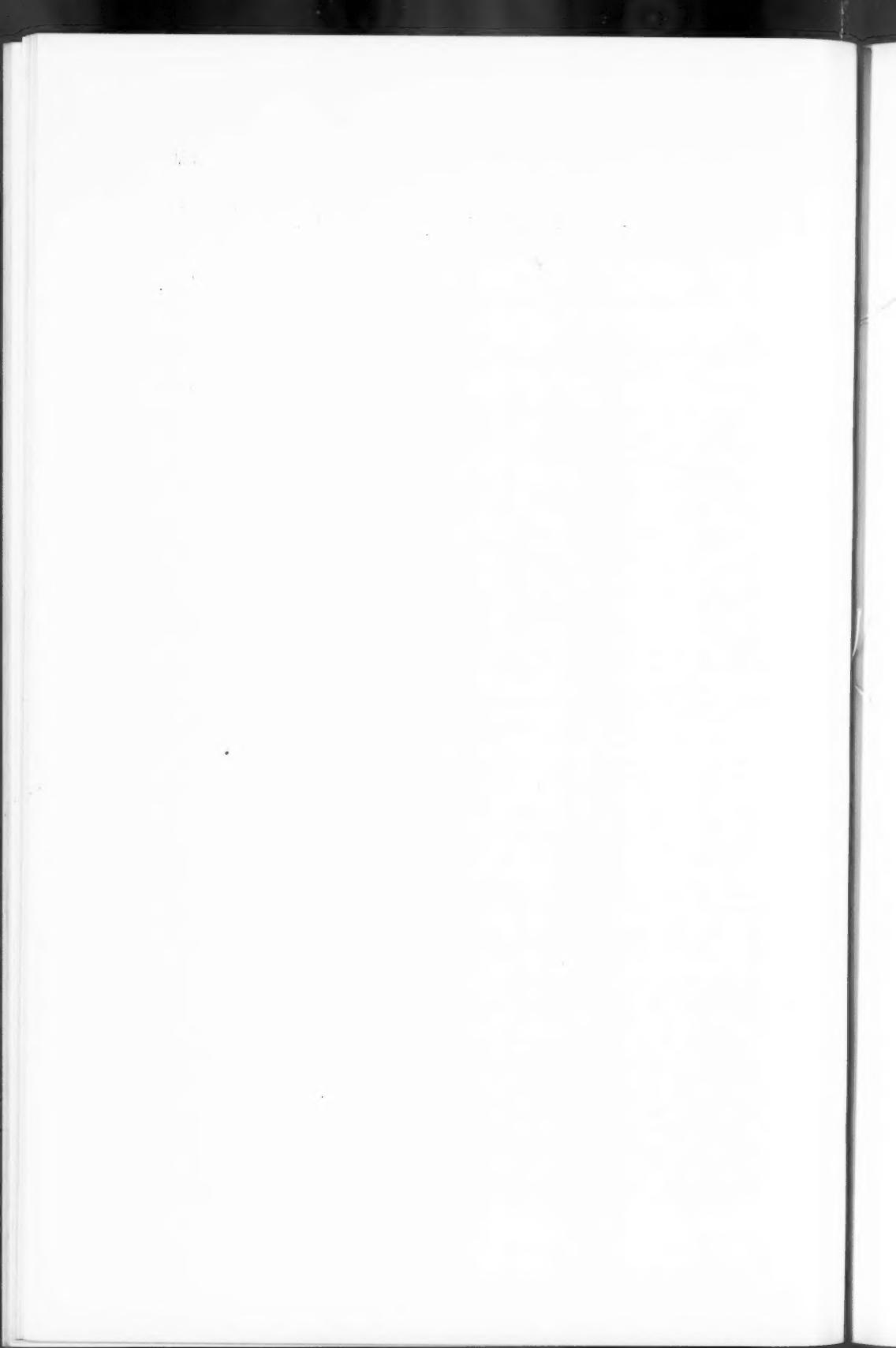
The "Mental Hygiene" movement appears to be doing good work, both in New York and Canada, and is focusing interest in mental work and assisting to start progressive developments. The energy of Mr. Clifford Beers in New York and Dr. Hincks in Toronto has largely contributed to this.

In general I felt that real progress is being made, particularly in regard to providing clinics and reception units. The attitude of the progressive workers in the mental hospitals appears good. Every endeavour is made to link up with the general hospitals and the general trend of medicine. I was told frequently that it was recognized that the policy of isolation was a great mistake, and every endeavour was being made to change it. Considerable success seems to be attending these efforts, possibly owing to the energy of the Mental Hygiene Movement, and prejudice and lack of understanding are becoming less evident in consequence.

The "prevention" and "mental hygiene" departments of the New York and Massachusetts mental departments were most hopeful, and suggested an attempt to deal with the problems as a whole in a progressive manner.

Dr. J. R. REES said that he greatly appreciated these two papers because of a similar, though rather shorter tour that he himself had taken in America. He particularly welcomed Dr. Mapother's emphasis upon the generally progressive attitude towards psychiatry of the medical profession and others in America. There was no breach between the mental hospitals' service and those who were doing psychiatric work outside, with earlier cases. All of these alike were designated "psychiatrists," a much wider and more correct classification. It was significant of the break-away from the idea of "maintenance," to which Dr. Mapother had referred, that chronic cases were usually known as "extended treatment" cases.

He would like to stress, in reference to Dr. Petrie's paper, the importance and thoroughness of the occupational therapy movement in connection with mental hospitals and clinics. There were between two or three hundred well-trained workers in occupational therapy in the mental hospitals of New York State alone.



## Section of Surgery. SUB-SECTION OF PROCTOLOGY.

[January 15, 1930.]

**Perineal Excision of the Rectum : Cinematographic Demonstration.—**  
J. P. LOCKHART-MUMMERY, F.R.C.S.

The first film showed the colostomy operation, and other films demonstrated the technique of spinal anaesthesia and the complete removal of the rectum by the perineal route. The last picture showed the patient three weeks after operation.

The film was made by the Kodak Company, Ltd., and the photographs were taken in St. Mark's Hospital.

**Specimens Demonstrating Method of Classification of Rectal Carcinoma.**  
—J. P. LOCKHART-MUMMERY, F.R.C.S.

The classification is that adopted at St. Mark's Hospital. Cases are classified A, B and C: (A) very early cases in which the muscle coat is not perforated; (B) medium, in which the muscle coat is perforated but there are no infected glands or deposits in surrounding tissues; (C) where the glands and outside tissues are involved and the muscular coat is invaded. It was found, as a result of keeping careful records of cases classified in this way, that the cures on a 5-year basis were over 70% in the A cases, and 48% of all three classes taken together, whereas in the C cases alone, the proportion of cures was about 43%. The mortality of the operation was quite low. Out of 138 private cases there were only four deaths—a mortality of 2·8%.

Mr. LOCKHART-MUMMERY also showed two specimens of sarcoma of the rectum.

**Sacro-Coccygeal Dermoid Cyst and Fistula.**—LIONEL NORBURY, F.R.C.S.  
The specimen has been dissected to show a post-anal dermoid cyst and the fistulous track by which it opened on to the skin.

The patient, E. B., a woman aged 26, was admitted to St. Mark's Hospital, May 19, 1929, suffering from aching pain in the back and a discharging fistula of some years' standing. The cavity filled up and discharged periodically.

*On examination:* Two small openings were present over the coccyx and a probe passed in about 2 in. into a cavity in front of the coccyx.

May 22, 1929.—The coccyx was removed and the cyst and track were excised, the wound being left widely open. Healing was slow and on July 10, 1929, the granulating wound was skin-grafted by Thiersch's method.

September 6, 1929.—Patient discharged, with wound almost completely healed.

Pathologist's report showed the fistula to be a congenital one, leading by means of a long track to a cavity in front of the coccyx.

**Case of Fistula-in-Ano, Communicating with Pelvic Colon.**—LIONEL NORBURY, F.R.C.S.

G. F., male, aged 56, admitted to St. Mark's Hospital, October 7, 1929.

History of anal abscess three years ago. This had been incised, but had recurred and discharged copiously.

*On examination.*—Three external openings discharging pus were present, close to scar of old operation. Much induration around.

*Operation (9.10.29).*—Fistulous tracts laid open, deep tract found passing up parallel to bowel for about 6 in. and lined with dense fibrous tissue. Hard mass of fibrous tissue present between the bowel wall and tract. Portion sent for microscopy. Tract drained by means of a long tube.

*Microscopic examination* showed the tissue to be of an inflammatory nature; no sign of new growth.



Fistula communicating with pelvic colon. (Mr. Norbury's case.)

*Sigmoidoscopy.*—No sign of any internal opening to 18 cm., although faeces were discharging freely through the sinus. X-ray examination after an injection of lipiodol through tract showed definite communication with pelvic colon, as shown in the accompanying illustration.

13.11.1929.—Left iliac colostomy performed. Later, sinus closing slowly; no discharge of faeces. Lipiodol, 2 c.c., injected twice a week as a curative measure.

It is hoped in due course to close the colostomy. The origin of the fistula is doubtful, but may be due to a perforating diverticulum of the pelvic colon.

**Early Carcinoma of the Rectum. (B.2 Case).—LIONEL NORBURY, F.R.C.S.**

The specimen shows an early carcinoma situated on the lateral wall of the rectum. The growth takes the form of an exuberant mass with a slightly ulcerated centre. An isolated papilloma is seen to the left of the tumour. Microscopic examination shows the growth to be an adeno-carcinoma which has spread by direct continuity into the longitudinal muscle coat, but has not yet reached the peri-rectal tissues. The lymphatic glands do not contain metastases. From the point of view of prognosis this is a B.2 case.

The case is of interest as demonstrating the fact that the more exuberant the growth, the less infiltration there is likely to be, and the more ulcerating the growth, the deeper will be the spread through the bowel wall.

This invasion of the bowel wall is most marked immediately deep to the ulcerating area. The specimen also shows a papilloma.

Dr. Cuthbert Dukes has shown that such papillomata, which are often multiple, are more often associated with *early* malignant disease and are part of a generalized epithelial proliferation of the rectal mucous membrane and not the result of irritating discharges from an already established malignant growth.

**Specimen of Carcinoma of Rectum (C Case) Excised after Radium Treatment had been Unsuccessful.—Sir CHARLES GORDON-WATSON, K.B.E., F.R.C.S.**

*History.*—Male, aged 49.

January, 1928.—Small rectal papillomatous growth just above anal canal removed by a practitioner in the country. Microscopical report: Early adeno-carcinoma.

February, 1928.—Recurrence  $3 \times 2$  cm.

13.2.1928.—At Radium Institute. Radium applied. 50 mgm. tube in canal two hours = 100 mgm.-hrs.; three 5 mgm. needles into growth 24 hours = 360 mgm.-hrs. 14.2.1928.—37 mgm. surface application 10 hours (perineum) = 370 mgm.-hrs. 15.2.1928.—50 mgm. surface application 15 hours = 750 mgm.-hrs. 16.2.1928.—37 mgm. surface application 10 hours = 370 mgm.-hrs. Total = 1,950 mgm.-hrs.

30.3.1928.—Condition reported satisfactory. Smooth mucosa. January, 1929.—Rectal haemorrhage slight. 31.1.1929.—Recurrence size of shilling. 1.2.1929.—60 mgm. surface application 15 hours = 900 mgm.-hrs.; 2.2.1929.—8 radon seeds 1.0 mc./0.3 mm. (platinum) = 1,064 mgm.-hrs.; 60 mgm. surface application = 900 mgm.-hrs. Total = 2,864 mgm.-hrs.; Result reported satisfactory.

31.3.1929.—Circular ulcer size of shilling. 14.6.1929.—12 seeds 1.5 mc./0.5 gm. (gold) = 2,394 mc.-hrs.

November, 1929.—Seen by exhibitor. Ulcerating fixed growth 2 inches diameter.

December, 1929.—Colostomy and perineal excision (St. Bartholomew's Hospital.)

[February 12, 1930.]

## DISCUSSION ON THE FACTORS MAKING FOR SAFETY IN THE SURGERY OF THE COLON AND RECTUM.

**Mr. G. Gordon-Taylor:** The major operations of surgery in respect of the rectum and colon are so largely concerned with malignant disease that I will deal principally with the factors making for safety in the cancer surgery of the large bowel. Surely, however, the *safety* of an operative procedure is not the only consideration when the cancer surgery of any region is under discussion. Half-hearted surgery may have, on occasion, cured the cancer victim, but in our present state of knowledge I maintain that the most thorough extirpation of the disease by ruthless surgery holds out the brightest prospect of a cure. A niggardly resection of the colon dealing neither with the zone of lymphatic spread to the glands in the meso-colon nor with the potential zone of permeation along the gut-wall may be "safe," but it is not a really efficient manoeuvre to cure the malady. A palliative anastomosis or a mere external drainage operation may be the measure of greatest safety to the patient and of least anxiety to the surgeon, but it leaves the victim with his dosage of malignancy unchecked. In cancer surgery "efficiency with safety" should be the watchword, and *judgment*, that most valuable asset the surgeon can possess, will decide whether in any particular case of malignant disease, "safety first" is to be the guiding principle, or whether the most whole-hearted endeavour to effect a cure should be made, although the risk to life might be greater.

That the operative mortality of the radical surgery of *cancer of the colon* is capable of improvement may be gauged from the perusal of operation statistics. Sistrunk, of the Mayo Clinic, after affirming that surgery offers the only known cure for malignant disease of the colon, and that the end-results are in many cases highly satisfactory, deprecates and deplores the high mortality of colectomy. "Except for operation in certain serious emergency cases," he writes, "the mortality following operations for cancer of the colon is perhaps higher than in any other type of intra-abdominal operation."

Grey Turner, in his Annual Oration to the Medical Society of London in 1929 admitted an operative mortality of 12·28%, but many of his cases were most complicated resections. He emphasized the truth that in surgery operability and mortality go hand-in-hand. A low operability rate and superb figures indicate the timid: the surgeon who is anxious to extend the frontiers of his operation to include all cases in which it is possible to extirpate the primary growth and its extensions completely—unless of course there is evidence of distant dissemination—may have a high mortality, but at the end of years will be able to boast of more cures than the colleague who is more cautious in his selection of cases. In Grey Turner's opinion a 5% mortality for colon resection for cancer would represent the acme of judgment and the perfection of technical skill.

In the surgical removal of a carcinomatous colon, the success or failure of the undertaking depends in almost every case upon the manipulations necessary to deliver and resect the tumour and upon the healing of the anastomosis performed to restore the continuity of the intestinal canal.

It is established beyond controversy that preliminary drainage has a profound effect upon the septicity of the bowel contents and even of the bowel wall itself at the site and in the vicinity of the new growth. The effect of drainage is of course most marked when the cancer is of the obstructive variety. Not only is the gut itself rendered less septic by this procedure, but the micro-organisms in the lymphatics and the lymphatic glands related to the tumour, diminish in numbers and become less virulent—the risk, therefore, of a diffuse infection of the cælum resulting from

the necessary manipulations to remove the cancerous segment of bowel and its lymphatic territory on a later occasion, is greatly lessened.

Sistrunk in his paper on "Factors of Safety in Operations for Carcinoma of the Colon," *Journ. Amer. Med. Assoc.*, 1928, affirms the importance of pre-operative treatment, but though benefits may result from intestinal antiseptics, diet, purgatives, enemata, etc., there is no pre-resection measure of safety like preliminary drainage of the large bowel. When the growth in the colon is situated beyond the cæcum, cæcostomy is in almost every case the procedure of choice. When a cancerous cæcum requires removal, a preliminary ileo-transversostomy is a valuable measure of safety; for even though right-sided colectomy may be performed with a fair measure of safety as a one-stage operation, even in the presence of a certain degree of obstruction, nevertheless a two-stage or even three-stage operation makes for greater safety still.

Grey Turner (*loc. cit.*) urges the following points in favour of a preliminary cæcostomy:—

(1) It relieves obstruction, whether acute, partial or potential. (2) It prevents recurring distension of the colon by gas, which is so apt to occur when the function of the great bowel has for some time been interfered with. (3) It allows the bowel to recover from the effect of obstruction of any degree, both as regards infection and muscle-tone. (4) It permits the great bowel to empty, not necessarily entirely through the cæcostomy, but by relieving the disturbed function and by allowing relaxation of its wall. (5) It permits irrigation of the bowel either from the anus to the cæcostomy or *vice versa*. (6) It relieves pain, and enables the patient to get natural sleep and to assimilate nourishment.

If the cæcostomy is to be performed as a preliminary operation, it is not enough to make a valvular cæcostomy. An actual artificial anus should be established so that the faecal stream will be largely or wholly deflected; it does not matter if another operation is required for its closure.

The only occasions on which I make use of a valvular cæcostomy [3] apart from the treatment of colitis, are those in which previously healthy bowel requires removal because of injury; it is true that in the late war, colon injuries were in most cases capable of being "cobbled," but in cases of very severe infarction, etc., it was sometimes necessary to resect. Valvular cæcostomy can also be used with advantage as a prophylactic or temporary measure in those cases in which a large intestine resection is necessary, because it is secondarily involved in some morbid process originating in an adjacent organ or structure. In many of these cases there is no obstruction, and the mucous lining and lumen of the bowel are unchanged. In such cases of secondary involvement of the colon, if even partial obstruction should be present, I would alter my technique and perform my operation in stages.

The greater my experience of colonic surgery, the more do I find myself practising a two-stage or, if necessary, a three-stage operation, and I have no doubt in my mind that the mortality of the resection is lowered thereby.

Two other pre-operative measures are worthy of mention: (1) Blood-transfusion, which is particularly indicated in those cases which have been associated with intestinal haemorrhage, occult or otherwise, and is therefore not infrequently required in right-sided growths. It is also the most valuable method we possess for the treatment of post-operative shock. (2) Preliminary immunization, of which I have had but little experience, although I have used it occasionally. My experience of the preliminary use of nucleinate of soda in order to induce hyperleucocytosis is comparatively small.

*Technique.*—In a meeting of surgeons it is unnecessary to emphasize the importance of bowel mobilization, on which Lord Moynihan has laid such stress, nor have I any particular views as to the method of bowel anastomosis which should be employed. The surgeon should be prepared to adopt that method which

seems most suited to the requirements of the case. When an attempt is made to perform a really radical extirpation of the potentially affected zone I employ end-to-end suture or a side-to-side junction; I do not, myself, favour the end-to-side method of union. What counts is the manner in which the anastomosis is performed, not the type of junction which is practised.

There can be no doubt that the Paul-Mikulicz exteriorization methods of colonic resection are those attended with the lowest mortality, but that this technique permits the most radical removal of the lymphatic territory is, in my opinion, somewhat uncertain, and it must be remembered that, according to Clogg [4], the glands are affected in 68% of the cases.

For cases of volvulus, for hyperplastic tuberculosis, and for certain cases of diverticulitis demanding resection where questions of lymph territory are relatively unimportant, the method is often ideal. It is useful and I employ it—I hope, with judgment—in cases of bad operation risks among cancer patients, especially the aged, the fat, and those with associated infection. Even in those cases in which I contemplate this type of operation I often perform a preliminary cæcostomy, or failing this, a prophylactic cæcostomy of the valvular type at the time of the Mikulicz operation.

Flint quotes Lord Moynihan as never having lost a case of exteriorization-resection and mentions that he himself has had but one death in 30 cases. The value of the operation is constantly brought before the surgical profession, and in recent years Grey Turner, Wilkie, Moszkowicz [5], Schwartz and Hartglass [6], Charles Mayo [7], and many others have from time to time advocated its claims.

In connection with the methods of intra-abdominal anastomosis it must be remembered that many of the patients are elderly, that very many have degenerative changes in their vessels, and that the tendency to thrombosis in the arterioles and veins supplying the wall of the bowel is aggravated by bowel sepsis and the manipulation necessary to remove the growth and its lymphatic territory.

I avoid all large crushing clamps, contenting myself with a small Payr's clamp for each end and I seem to use interrupted sutures more and more frequently.

So anxious do I feel about any colonic resection that, when I can, I avoid the middle line of the abdominal wall and the "mid-stream" of the abdominal cavity, making my attack, where possible, out at the sides or in the flanks, in close proximity to the tumour and I always drain: many a time a drain has helped the patient in the event of a leak.

*Anæsthesia.*—In the matter of anæsthesia it is our practice to employ regional or paravertebral anæsthesia along with light general anaesthesia. This method obviates the disadvantages and risks of deep narcosis and avoids the dangers inseparable from high spinal anæsthesia, whatever be the drug and whosoever the anæsthetist employing it.

The state of the blood-vessels of the patient, the virulence of the bowel organisms and the general condition of the patient are the three factors which decide the issue of the case, but preliminary bowel drainage, choice of operation and surgical judgment in its conduct may turn the battle in the patient's favour.

When the extirpation of a *cancerous rectum* is under consideration, the treatment of malignant disease of this portion of the bowel may be discussed under the headings of (A) ampullary and anal carcinoma and (B) recto-sigmoid growths.

(A) *Cancer of the Perineal Rectum.*—The surgery of malignant disease is the surgery of the lymphatic system: it cannot be controverted that the only really radical operation for a carcinomatous rectum, an operation based upon a sound knowledge of lymphatic anatomy and of pathology, is the abdomino-perineal method of my friend, Ernest Miles. In his Lettsomian Lectures, 1923, and elsewhere, he has recorded the evolution of the operation and there he states that he now finds himself compelled, "except as a palliative operation, to abandon all forms of

perineal excision of the rectum." It must, unfortunately, be admitted that although the abdomino-perineal method of Miles is the only radical or ideal operation for a malignant rectum, nevertheless for a considerable percentage of cases, and in the hands of a considerable percentage of surgeons, a radical procedure of the magnitude of the Miles operation is beyond the powers of the patient's recovery.

For these patients, then, the best possible—the most radical—cannot be performed; considerations of safety demand that a less radical procedure be carried out. The relative percentage of cases to which the radical or a "makeshift" procedure is applicable will naturally vary with the condition of the patient and with the skill and experience of the surgeon; a "super-surgeon," like the inventor of the operation, will secure success, where the less skilled or experienced has to admit failure.

It is therefore with reluctance, and with a sense of personal inferiority that in many cases, certainly in more cases than I could wish, I find myself compelled to practise that which I know to be imperfect. (a) In the case of a very bad operation risk in which I consider that I am not justified in doing more than a perineal excision, it is at any rate comforting to peruse the end-results of other operators who employ this method, viz., the type of operation whose claims have been so ably urged by Lockhart-Mummery. With this type of operation its distinguished protagonist finds 50% five-year cures, while in favourable cases, over 75% are well at the end of five years, and it is further to be remembered that these results are obtained in his hands at the really extraordinary mortality-rate of some 2 or 3%.

The collected statistics of St. Mark's Hospital, compiled by Mr. Gabriel up to July, 1924, are not quite such good reading and exhibit a higher operative risk, though for the last few years it has been only 12%; nor are the end-results as good as those shown by Lockhart-Mummery's figures; there are 28.5% of five-year cases.

It is difficult to imagine that operative results can be reduced to a lower rate than these really superb figures of Lockhart-Mummery. No factor of safety can surely be neglected to obtain results like these; and there is surely no new point in technique which can still further diminish the risk of a major operation which has an operative mortality of 2%.

My end-results, unfortunately, do not justify the optimism indulged in by those who practise the perineal operation. It may indeed be safe, but from my end-results it must often have been inefficient.

(b) In performing the abdomino-perineal excision in the ideal subject I have found that a division of the operation into two stages makes it a less formidable procedure. When discussing the surgery of the colon I strongly advocated the principle of preliminary drainage; in the case of a malignant rectum I invariably perform a preliminary left iliac colostomy, proceeding to the extirpation of the sigmoid and rectum at a subsequent date.

To offer any criticisms on the anaesthetic would be a presumption; one will probably do best by following the precepts of Miles himself.

(c) In the intermediate type of case, when I consider that the patient is unlikely to stand the Miles operation, I have found the following modification helpful. After a preliminary abdominal exploration and the performance of a left iliac colostomy, from ten days to a fortnight previously, the radical operation is begun at the perineum. A wide extirpation of the rectum and all the perineal tissues is made, the patient being in the exaggerated lithotomy position; this position is adopted to prevent the fall of blood-pressure and general upset which frequently ensue when the position of the patient is changed from the Trendelenburg to the left lateral or vice versa. The previous abdominal incision is reopened and the protected bowel is rapidly and easily pulled up into the abdominal cavity, stripping up with it the meso-rectum and meso-sigmoid. The necessary points of the abdominal stage of

the operation are quickly attended to, the sigmoid is divided across just below the colostomy. The peritoneal toilette having been completed, the abdomen is closed. The legs are then held up by two assistants and the perineal wound is tamponned and closed in the ordinary way.

I dislike the creation of a new name for some trifling modification of technique, and although I have ventured to speak of this as the *perineo-abdominal method*, the operation is not original. I first saw Grey Turner use it in an emergency many years ago. This operation may be "makeshift," but it is not so "makeshift" as the mere perineal; it is much more radical, and it is not unsafe. In my hands it is associated with no increased mortality over the mere perineal type of operation. The greater part of the time is spent on the perineal stage of the operation; the abdominal stage is very brief. I do not know why it appears, in my hands at any rate, to be safer than the operation performed in the orthodox manner of Miles, but I find myself employing it more and more frequently.

(d) There is a tendency at the moment to utilize radium therapy in addition to the extirpation of the rectum by the perineal route. It is hoped that by the introduction of radium tubes into the meso-colon or meso-rectum the upward extramural lymphatic spread may be adequately "barraged." This is merely a hypnotic piece of technique on the part of the surgeon. These needles can be introduced more or less haphazard in the depths of the perineal wound or they may be inserted more accurately after reopening the abdomen. Should the abdomen require to be reopened for this purpose I make bold to say that the patient's interests will be far better served by a perineo-abdominal operation, a procedure with no increased mortality over that of a mere perineal excision.

One knows the futility of radium therapy for the lymphatic territory of the neck in cases of lingual and mouth cancer, a form of cancer relatively radio-sensitive. Is it likely, in the present stage of our knowledge of cancer therapy, that haphazard introduction of radium tubes into the mesentery is going to harrage the upward spread of cancer cells which are not radio-sensitive? The procedure may occasion more harm than good.

(e) If the circumstances of the case demand that safety alone be considered, a mere colostomy may be the operation of choice. In certain cases when radical surgery seems to be inadvisable, I refrain from doing more than a colostomy, reflecting that prolongation of life by some months, or even by a year, or two years, may be of value.

(f) In some such cases the introduction of radium in addition may be useful, but it is also well to remember that in some of these cases of "radium therapy" the hopes entertained of prolongation of life by colostomy have not been fulfilled, and the patient's end has come more quickly and more miserably than it would have done had the surgeon refrained from doing more than create an artificial anus.

(B) In the case of *recto-sigmoid growths* both camps of proctologists appear to agree that (a) the abdomino-perineal method is required for the satisfactory extirpation of a neoplasm in this situation. The operation is one of severity: Lockhart-Mummery, in 1923, admits a mortality of 27%. Ernest Miles, in his Lettsomian Lecture for 1923, gives a mortality of under 10%; his mortality rate of quite recent years is still lower. These latter figures are those of a "superman," and represent the result of the highest perfection of skill and the acme of judgment.

In this situation the upward extramural spread is of far the greatest consequence, and the anatomical researches of Villemin, Huard, and Montagué [9], of Bordeaux, have recently demonstrated that the lymphatic territory of the "colic rectum" or "high rectum" (which they regard as a segment of colon prolapsed into the pelvis) is purely abdominal, and does not anastomose freely with the lymphatics of the pelvis. There is, therefore, perhaps anatomical justification for a purely abdominal operation for the removal of a growth in that situation; nevertheless it is well to remember

that the lymphatic territory of the anatomist in any particular region by no means corresponds to the lymphatic territory of the surgeon ; there is a lymphatic territory of the living and a lymphatic territory of the dead. In the case of the tongue, for example, the lymphatic territory of the anatomist is by no means so extensive as the lymphatic territory connected with the tongue, as revealed by secondary glands or recurrences. It is not less certainly so in the case of carcinoma of the sigmo-rectum.

(b) For many years I have on occasion performed a *purely abdominal operation*, leaving the patient with a permanent colostomy and an excluded segment of the rectum at its lowest end. The operation is safe and in my hands has produced good end-results. Hartmann, in the *Journal de Chirurgie*, has recently drawn attention to it. The difficulties of the operation are chiefly concerned with the management of the terminal rectum. Some injection experiments with the inferior haemorrhoidal artery demonstrated that its territory is a limited one and the bowel must therefore be sectioned deep down in the pelvis.

(c) Difficulties in a fat patient with a deep pelvis may make this operation one of difficulty and uncertainty, and it may prove safer and easier to perform a *perineo-abdominal operation*—a procedure which, at the same time, is more radical and thorough in its character.

(d) In the poorest risks it may be well to deal palliatively with the condition purely by the perineal method of approach, (e) or the surgeon may limit himself to the mere performance of colostomy.

It is possible with the abdominal or Hartmann [10] type of operation to effect a restoration to a normal state of affairs by subsequently bringing down the colon to the anal canal. This I have done frequently for tubercle and for other inflammatory lesions ; but in the case of malignant disease I am fearful of stirring up dormant cancer cells.

(f) On the Continent there appears to have been, of recent years, an attempt to revive some of the operations which aim at conserving the sphincter and bringing down the upper segment of the intestine through the anus—the *abdomino-anal method* : in this country this type of operation, fortunately, finds but little favour.

If the patient's condition, or the position of the growth, is such as to justify or necessitate an extirpation by the combined route then the patient's interests will be best served by a whole-hearted attempt to save his life and to cure him. The abdomino-anal type of operation carries a double risk : a risk of death from gangrene of the upper segment of the bowel and a risk of recurrence from imperfect removal.

The operation is now advocated, where possible, by one of the most brilliant of German surgeons, Kirschner [11] of Tübingen. Its claims have been urged by Coffey, and in England, Mr. Turner Warwick has a predilection for it ; it has also been advocated by some French operators, notably by Schwartz [12] of Paris. It is not, to my mind, a measure of safety ; it is a procedure of jeopardy to the patient at the time and in the years to come.

The greatest factor for safety in the management of a carcinomatous rectum is undoubtedly the judgment of the surgeon. In forming a judicious estimate of his patient he will take into consideration the age, the sex, the cardiovascular system ; the urinary tract and the bodily configuration of the invalid will also demand attention. A preliminary microscopic section of the tumour may be possible, and may help in forming an opinion as to the malignancy of the particular cancer, although I am not aware that any satisfactory histological classification of growths on the Broders plan has yet been forthcoming. The surgeon may utilize the Moots-McKesson test of operability by employing what is termed the "pressure-ratio percentage" ; the pulse pressure over the diastolic pressure is calculated in percentages, the normal being about 50%. If the pressure-ratio is high or low, there is reason to apprehend danger. If below 25% or above 75% the case is inoperable.

When all is said and done, that surgeon will be most safe and most successful who employs the appropriate operation for the particular case.

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**Mr. Lionel E. C. Norbury:** Operations on the large bowel must be placed in a different category from those on the small bowel, as a result of differences in their bacterial contents.

It is impossible, by preliminary treatment, to render the large bowel aseptic, although much can be done to modify the virulence of the organisms present.

In acute obstruction of the large bowel it is a well-established principle that operative measures should be confined in the first instance to drainage of the colon, either by cæcostomy or colostomy. In the absence of acute obstruction, preliminary colonic lavage will go a long way towards minimizing the risk of septic complications.

**Anæsthesia.**—Extensive operations on the large bowel, especially in debilitated patients, are often attended by severe shock. Spinal anæsthesia, either alone or combined with gas-and-oxygen or with ether, is a great safeguard.

With patients suffering from chronic bronchitis, spinal anæsthesia is not unattended with risk, since it is inadvisable to employ the Fowler's position after a spinal anæsthetic, at any rate for a few days, whereas this position is essential in the presence of pulmonary complications. Local anæsthesia, combined with gas and oxygen, will often solve the difficulty.

**Points in Operative Technique.**—With axial anastomosis after resection of the colon, it is of the utmost importance to be sure that the divided ends of the bowel have a good blood-supply, otherwise sloughing and non-union will result. This complication may be obviated to a great extent by division of the bowel obliquely, so that at the point of section, the mesenteric border is longer than the anti-mesenteric.

Personally, when possible, I prefer a lateral anastomosis to an axial union, and I have had better results by this method.

Lateral anastomosis is, however, often impossible, especially after resection of the pelvic colon, owing to the short distal loop of bowel and the depth at which one has to work. The simple procedure of wrapping a piece of omentum around the line of suture and securing it in position, is an extra safeguard and should be carried out whenever possible.

After resection and anastomosis of the colon, adequate drainage of the area of operation by means of a tube for from twenty-four to forty-eight hours is a most important factor making for safety. Such drainage does not increase the length of convalescence, and in my opinion should be employed as a routine.

Similarly, after appendicectomy in certain cases of acute appendicitis, I am confident that the more general employment of a drainage tube for one or two days would result in a greatly diminished rate of mortality.

I have had no personal experience of resection and anastomosis by the "closed method."

Temporary cæcostomy, after resection of the colon and anastomosis, is without doubt a great safeguard. The site of anastomosis is by this means left undisturbed, and not stretched by accumulation of flatus for a week or ten days, thus favouring rapid and sound union. Also salt solution can be safely administered through the cæcostomy tube, without disturbing the patient.

*Blind Cæcostomy in Acute Intestinal Obstruction.*—There is no doubt that lives have been saved by the performance of a blind cæcostomy in patients suffering from acute obstruction of the large bowel; in a number of cases, however, it is found that the cæcostomy only drains the cæcum and ascending colon, whereas the rest of the bowel beyond the hepatic flexure remains distended.

In my experience colostomy, a short distance above the site of obstruction, promotes better drainage of the bowel in the majority of cases. Cæcostomy, under local anaesthesia, is a much less formidable undertaking, and may be the operation of choice in patients who are seriously ill.

I wish to make only a few remarks with regard to the surgery of the rectum.

Prolonged and careful cleansing of the lumen of the bowel is as important in rectal operations as in operations on the colon, and I feel sure that the sub-aqueous intestinal bath apparatus will prove a most valuable adjunct to the surgery of the large bowel.

In perineal excision of the rectum the two-stage operation is usually employed at the present time: namely, colostomy, followed by excision some seven to fourteen days later. This two-stage method is strongly indicated when any degree of chronic obstruction is present in the rectum. If, however, the bowel can be thoroughly irrigated and cleansed by means of the sub-aqueous bath, there is no reason why colostomy and excision in one stage should not be performed as a routine.

**Mr. W. B. Gabriel:** The previous speakers have been in favour of performing an open cæcostomy by bringing a portion of the cæcum out and suturing it to the skin. I do not see what advantage this method has over the tube method. I usually employ a large de Pezzer catheter with the blunt end cut off, leaving a funnel-shaped expansion at the end of the tube. At the present time I have a patient who has had a No. 20 (English scale) de Pezzer catheter in the cæcum continuously for 19 days; it has acted perfectly and there has been no leakage.

I have put on view a few preparations to show a method of removing, for confirmatory section, portions of malignant tumours through a sigmoidoscope. The instrument is a Brünings forceps with hollowed cutting ends which render it easy to nibble off pieces of growth uncrushed and of a suitable size for sectioning. The indications for use of this instrument are as follows: (1) for confirmation of malignancy of operable tumours previous to radical operation; (2) in cases to be treated by radium; (3) in cases of inoperable tumours it is often advisable to establish the diagnosis microscopically; (4) in ulcers of doubtful nature.

**Professor A. W. Sheen** said that with regard to the colon growths, he favoured side-to-side anastomosis after excision and regarded free mobilization of the bowel as greatly helping the technique. He found abdomino-perineal excision of the rectum easier and attended by better results in women than in men, and preferred to do the operation in one sitting because of certain disadvantages of secondary operations. He thought radium was of little use in advanced rectal cases, as in advanced carcinoma elsewhere, and cited a case to support his view that radium could be used with advantage in early operable rectal carcinoma.

**Mr. E. T. C. Milligan:** It is usual to refer in a contribution like this to one's surgical triumphs and exploits and mention, with some pride, one's small mortality-rate. However, to emphasize my theme I will refer not to triumphs but to tragedies, and instead of mentioning my own mortality-rate I will draw my examples from the practice of other surgeons as well as from my own. Such examples serve to state the problems of surgery of the "left" colon better than mortality-rates.

Case 1.—A carcinoma of the upper rectum was explored through an abdominal incision. Its limits and fixation to surrounding structures were determined by careful palpation. Nothing further was done as the growth was pronounced inoperable. The patient subsequently developed peritonitis and died in a few days. Infected adhesions were disturbed.

Case 2.—An operable growth of the pelvic colon was "freed" from the lateral wall of the pelvis where it was adherent to the parietal peritoneum for about 1 in. square. The loop and growth were fixed outside the closed abdomen for subsequent excision. The patient died in a few days from peritonitis. In neither of these cases was the lumen of the bowel opened inside the abdomen.

Case 3.—A tiny malignant growth of the pelvic colon,  $\frac{1}{2}$  in. in diameter, was removed by excision of the segment of bowel containing the growth, and end-to-end union practised. The patient subsequently died because small-gut obstruction from recent infective adhesions was not recognized in time for relief.

Case 4.—The lower part of the pelvic colon was incised to remove a pedunculated adenoma which could not be dealt with in any other way. The patient died from a most virulent septicaemia and peritonitis.

Case 5.—A pelvic colon growth was removed with a segment of gut and end-to-end union practised, but no drainage tube was inserted. In a few days the patient became very ill and only recovered when a large abscess at the site of the anastomosis was evacuated.

Case 6.—Radium needles were inserted into and around an inoperable growth of the upper rectum and pelvic colon from the abdomen. Death occurred from peritonitis, the organisms following the track of the needle.

Case 7.—A colostomy was closed by the intraperitoneal method; the patient died from peritonitis.

It is only fair to say that all these manipulations and operations are commonly carried out with success. The cases quoted can be roughly classed into two groups:—

(1) Those in which the bowel was opened at the time of operation.

(2) Those in which the infected adhesions surrounding a carcinoma were disturbed but the bowel was not opened.

I suspect that infection occurs in nearly all cases at the time of operation and is not due to subsequent leakage at the site of union of the bowel. Such views must profoundly influence technique.

In the first group the mortality might be lowered, and our post-operative anxiety allayed if growths of the "left" colon were removed by exteriorization methods (Paul's operation or some modification) or by the closed method of bowel resection, whichever is best suited to the particular case. The extraperitoneal method of closure of the colostomy should always be adopted in preference to the intraperitoneal method if the occasional tragedy is to be averted.

In the second group it is wise, instead of breaking through infected adhesions, to excise the tissues beyond them and to remove adherent parietal peritoneum with the growth rather than strip the adherent growth off the parietal peritoneum.

I regard the employment of a drainage tube at the site of suture of the large bowel as a life-saving measure.

On two recent occasions, Devine's exteriorization modification of Paul's method has been used with the happy result that the normal faecal stream was totally restored in three weeks, and healing of the abdominal wound soon followed without further operation. A small ventral hernia was a small price to pay for such a satisfactory and safe proceeding.

Preliminary cæcostomy gives adequate drainage of the proximal bowel in obstruction between the cæcum and the splenic flexure, but for obstruction in the sigmoid colon a proximal colostomy is necessary if adequate drainage is desired.

In two recent cases cæcostomy (one valvular and one lateral) failed to restore the distended proximal loop above a growth in the sigmoid colon to convenient dimensions which would permit of union with the contracted distal segment at the second operation.

**Mr. Turner Warwick** said that with regard to the surgery of cancer of the rectum, he would like to call further attention to the two-stage abdomino-perineal operation by the method of Coffey. The abdominal portion of the operation was carried out as for an ordinary one-stage abdomino-perineal. The pelvic colon was divided and a terminal colostomy made. The freed lower portion of the pelvic colon and rectum above the growth was invaginated through the growth and anus. The pelvic peritoneum was closed and the space below drained either through the vagina or above the pubes through an isolated peritoneal tube. The second stage of the operation was performed about ten days later, when the devitalized portion of the bowel was very simply removed by the perineal route. He had tried the operation for the first time about two years ago in a case in which the one-stage abdomino-perineal operation seemed too great a risk—the patient being a large, fat man, 65 years old, who had a bulky and extensive growth. A colotomy had been already performed at another hospital, and he was admitted to Middlesex Hospital in the hope that radium would prove beneficial should the case be considered unsuitable for operation. His post-operative condition never at any time gave rise to the slightest anxiety, and the only trouble he has since experienced arose from the fact that the colostomy had no spur.

Since then he (the speaker) had performed the operation on four other patients and had obtained satisfactory immediate results on each occasion. The operation, thus performed, was well within the powers of the average surgeon (in contradistinction to the ordinary one-stage abdomino-perineal operation); the after-treatment demanded no special nursing experience, and the late results in no way differed from those of an abdomino-perineal operation successfully performed in one stage. With the use of the perineal excision for low rectal and anal growths, and this two-stage operation for high rectal and pelvi-rectal growths, the surgeon with ordinary skill and without a large experience was capable of dealing satisfactorily with all operable cases of cancer in these situations.

With regard to the surgery of cancer of the colon, he was more perturbed by the late results than by the questions of the site of the preliminary stoma and the exact method of anastomosis of the divided ends of the colon. His limited experience inclined him strongly to the view that cancer of the colon was much more malignant than was commonly believed. The teaching that operation in cancer of the colon gave satisfactory results even at a stage sufficiently advanced to produce complete obstruction, was misleading. During the years 1926-1927 he could recall operating on eight cases of acute obstruction due to cancer of the large bowel on the left side. In every case he had performed caecostomy for the acute obstruction, and subsequently resected the growth with the sole idea of complete extirpation. One of the patients had died as the result of the operation, four more had, he knew, since died from recurrences and of the remainder he had failed to trace two. The only one he knew definitely to be alive and apparently well had had a growth near the middle of the pelvic colon.

A cursory examination of the literature dealing with end-results of the surgery of colon cancer confirmed his view. The results of the Royal Infirmary, Edinburgh, collected over a period of ten years, gave very disappointing figures. Also according to a series published recently by Kuttner, out of sixty patients operated on, forty-six died within less than a year. Certainly, diagnosis of the condition before it had produced complete obstruction seemed to be important, if even fair late results were to be secured.

**Acetylcholine in Relation to Abdominal Surgery.**

Read by G. PARKER, F.R.C.S., for A. LAWRENCE ABEL, M.S.

## (ABSTRACT.)

IN the paper attention was called to research work, which had shown that Acetylcholine was essential to the proper functioning of the plexus of Auerbach.

Paralytic ileus would appear to be due either to a diminution in the normal quantity of acetylcholine present in the wall of the intestine, or to some external factor rendering the normal quantity insufficient for the transmission of the peristaltic wave. It was maintained that an injection of acetylcholine was more physiological and more likely to be followed by success in a severe case of paralytic ileus than the injection of pituitrin or eserin.

Several cases were quoted, in which all ordinary methods of dealing with paralytic ileus had been unavailing, and in which acetylcholine had effected a rapid and complete cure.

Its use was also advised in spasmotic stenosis, and in chronic constipation.

## Section of Otology.

[March 7, 1930.]

### Cysts of the Temporal Bone involving the Middle Ear and the Jugular Fossa.

By G. J. JENKINS, F.R.C.S.

THREE cases of new growth in the region of the jugular fossa, middle ear, and vertical portion of the seventh cranial nerve, have been under my observation in the last three years. The similarity of history, situation of disease, symptoms and clinical progress was striking, and indicated that the factors of incidence and progress must have been the same in all three.

In the early stage of the disease, when symptoms would be slight and progress slow, the diagnosis might easily be "unexplained deafness" or "facial paralysis." In the later stages, as in Case I (Mrs. C.), the diagnosis would be "gross malignant growth involving several cranial nerves, with a readily bleeding polypus in the ear."

In one of the three cases the diagnosis was cerebello-pontine angle tumour, and perhaps some of the failures to find an acoustic tumour may be due to such a mistake.

Case I, Mrs. C., aged 30. Admitted to King's College Hospital, London, July 22, 1926, suffering from severe pain of left side of head and profuse haemorrhage from left ear. She was six months pregnant.

*History.*—After influenza in 1915 she had had severe vertigo (? direction of fall) lasting some weeks; she needed help when walking. No vomiting. Gradually recovered completely.

Early in 1916 had a severe blow on the head by a fall from a tramcar. Not unconscious, and walked away to do ordinary day's work. A few weeks after the injury twitching of the left side of the face began. In June, 1916, was admitted to a hospital for nervous diseases. A few days ago the Registrar of this hospital kindly sent the following abstract of the notes made at that time: "Complete paralysis of left side of face and complete paralysis of left half of palate, and left sterno-mastoid muscle. Tongue protruded to left and left somewhat wasted. Reflexes and gait normal. Cerebrospinal fluid normal. Complained of noises in left ear; left ear very deaf. Spontaneous nystagmus to the right; nil to the left."

Diagnosis at the hospital: "Tumour of left cerebello-pontine angle."

On admission to King's College Hospital she was very ill from pain and loss of blood. The attacks of pain and bleeding had come on about four months previously but there had been no disturbance in the ear from the time she left the other hospital until recently—a period of nearly ten years. Large firm polypus blocked the deep meatus. No purulent discharge, or history of such discharge.

Weber to right. Rinne, positive on right; on left mastoid, sound referred to right ear.

Complete paralysis of seventh cranial nerve, left palate, left tongue, left larynx, left sterno-mastoid.

Caloric test, no reaction (on account of polypus). Wassermann reaction negative.

July 31, 1926.—Operation: Left external carotid artery tied. No note made about lateral sinus. What appeared to be a cyst extending to the region of the jugular bulb was opened. The dura mater of the posterior fossa was exposed.

A radical mastoid operation was carried out, and the polypoid mass in middle ear and meatus was removed.

Seven tubes of 8 mgm. radium were placed in the wound cavity. It was hoped that the operation would help the patient over the next three or four months. She had complete relief.

Readmitted December 8, 1927, for plastic operation and repair of ugly hole in mastoid.

Patient now shown,  $3\frac{1}{2}$  years after operation. The radical mastoid cavity is quite dry. The paralysis remains as at time of operation, but there has been no sign of recurrence, no pain and no bleeding.

Case II, Mr. B. Abstract of notes, January 10, 1928 : Paresis right side of face, five weeks. Deafness in right ear for three years, has gradually become worse. No pain or discharge. Tinnitus puffing in right ear; began one year ago. Not the slightest giddiness.

Accidents.—Has had three concussions, never causing bleeding from ear.

There was a conical red mass in the middle ear, arising from the floor in the posterior part of the cavity.

Weber to right. Bone conduction good in both ears. Rinne : Right, air and bone conduction almost equal at 90 d.v.; left, positive to all tones. Low-tone limit : Right, just hears low limit; left, hears limit well. High-tone limit (monochord) : by air conduction, Right 20 cm., left 19 cm.; by bone conduction : Right 16 cm., left 16 cm. Conversational voice : Right 24 ft. +, left 24 ft. + Whisper : Right 21 ft., left 24 ft.

No spontaneous nystagmus. Rombergism : Falls to right, with narrow base. Paresis, right side face (lower neuron). Puffing noise stopped by pressure on carotid.

Case III, Mrs. N. *History*, 1908 : Injury to right tibia, followed eighteen months later by blood tumour size of walnut. Removed by operation. 1920 : Fell from horse and struck head against a tree. 1923 : Severe labyrinthine disturbance with vertigo and vomiting.

October 4, 1926 : Deafness in left ear (this began twelve months after accident). Tinnitus : Buzzing. Vertigo (severe in 1923, lasting three months). Tympanic membrane normal. Weber to left. Bone conduction, diminished twenty seconds in right; fifteen in left. Rinne : Right, positive to all times; left, negative to 90 d.v. Low-tone limit : right, good; left, raised to 50 d.v. High-tone limit (monochord) by air conduction : 17 cm. in both ears. Conversational voice : Right 24 ft., left 18 ft. Whisper : Right 24 ft., left 3 ft. Inflation : No improvement.

May 15, 1927 : Deafness much increased. Bruises easily. Paralysis of seventh cranial nerve. Began by spasmoid contractions December 15, 1926. Paralysis noticed on January 3, 1927. Noted loss of taste. Left ear : Red convex mass in middle ear arising from floor and in posterior part of cavity. Weber to (?) right (bad witness for tuning forks). Bone conduction diminished in both ears, about twenty seconds. Rinne : Right positive to all tones; left, negative to C3 (heard with noise apparatus to right). Low-tone limit : Right good; left, raised to 90 d.v. High-tone limit (monochord) by air conduction : 16 cm. No spontaneous nystagmus. No Rombergism. No inco-ordination. Caloric tests : Cold in left; definite positive reaction; the lotion caused much pain in the ear. Palate : (?) Good. Tongue : Left side atrophy. Voice : Abductor paresis.

September 20, 1927 : Growth in middle ear much increased.

Skiagram, September 21, 1927 (Mr. Graham Hodgson). Definite evidence of changes in bone in region of jugular foramen. The patient was distressed by pain and worried by the obvious progress of the disease in so short a time.

November 29, 1927 : Operation for removal of growth as far as possible, and for implantation of radium. The external carotid was ligatured. The lateral sinus was sought for, but seemed to have disappeared entirely. By keeping in touch with the dura mater of the posterior fossa, the cyst was reached fairly easily.

I have not described the operation in detail, as I think it might be very much improved. In attempting to remove the cyst an opening was made into the subarachnoid space. This caused a great deal of trouble. Cerebrospinal fluid leaked out for six weeks afterwards. In the preliminary part of the operation I made a periosteum flap, which was very useful against the opening of the dura. The radium was put in at time of operation, and the wound packed with specially prepared iodoform gauze.

After receiving Dr. Creed's report of the microscopic section, it was decided to apply the radium again.

The result was very slow, weak healing; intermittently, for about a year, small pieces of necrosed bone appeared.

The wound has now been soundly healed for some time. There is no evidence of recurrence of the disease two and a half years after operation.

We may note the points of obvious similarity in these three cases :—

*Injury.*—In all three there was a history of severe injury to the head. Neither Mrs. C. nor Mrs. N. had been unconscious, but Mr. B. had been so on three occasions. There was no bleeding from the ears at the time of the accident in any case. Mrs. C. had a severe attack of vertigo before the accident.

*Deafness.*—The first symptom in all three was a middle-ear deafness and the next was tinnitus. These symptoms increased and in the advanced stage certain cranial nerves became affected.

*Seventh Cranial Nerve.*—Spasmodic twitching of one side of the face was the first indication of affection of this nerve in the cases of Mrs. C. and Mrs. N. This was followed by complete lower neuron facial paralysis. In Mr. B.'s case the paralysis was not complete when I examined him and he had not had a spasmodic stage.

*Other Cranial Nerves.*—The facial paralysis was followed, in the cases of Mrs. N. and Mrs. C., by paresis or paralysis of the palate, larynx, trapezius, etc., on the same side. Mrs. C. shows the persistence of these effects, though the tongue has recovered to a great extent.

*Tympanic Membrane : Middle Ear.*—Mrs. C. was seen at an earlier stage in 1916 at a hospital for nervous diseases. She complained of deafness and tinnitus in the left ear. The tympanic membrane was described as normal. Paralysis was found on the left side of the face, the left half of the palate, the left half of the larynx, left tongue, left sterno-mastoid, trapezius.

The deafness and tinnitus indicate that probably the middle ear was affected by the neoplasm, though no change in the tympanic membrane was noted. The later stage of the case was seen at King's College Hospital; then there was a polypus plugging the meatus, and it was the bleeding from this that first—in all those years—warned the patient of a change. Both Mrs. C. and Mrs. N. were examined in an early stage and the appearances of the neoplasms in the middle ear were very similar and characteristic in the two cases. A small bright red conical mass appeared in the postero-inferior part of the middle ear as if pushing through the floor. In Mrs. N. the tympanic membrane could be moved on this red mass by means of the Peters speculum. Mrs. N. did not reach the advanced stage attained by Mrs. C., but showed in some degree the paresis described. After operation the tongue, palate and larynx improved.

*Skigram.*—Another feature of great similarity was the X-ray picture in the two cases (those of Mrs. N. and Mr. B.) examined. Dr. Graham Hodgson has demonstrated that in these two cases the neoplasm is in the same anatomical position. There are sufficient facts to allow us to deduce that in these cases the disease must have begun from the same point, extended in more or less the same direction, and affected the same structures.

The early appearance of the tumour in the postero-inferior part of the middle ear, with the affection of the seventh cranial nerve at about the same time, indicates the point of incidence very accurately, especially as we know that middle-ear deafness and tinnitus have appeared in all three cases before the affection of this nerve. I venture to suggest that the probable point of incidence is in the outer wall of the jugular fossa, in close relation to the inner wall and floor of the middle ear, just in front of and internal to the seventh nerve.

The growth, in extending through the jugular fossa, would involve the other cranial nerves and obliterate the lateral sinus.

The cyst as found at operation in Mrs. N.'s case, was in relation with a considerable area of dura mater above the region of the jugular foramen; the floor was on soft tissue; the roof was in relation to the under surface of the labyrinth and middle ear. It seemed to reach as far forward as the internal carotid artery and my impression was that it extended inwards, in contact with the dura mater, to

about the internal auditory meatus. The seventh cranial nerve was in or just inside the outer wall of the cyst.

*Pathology.*—In both Mrs. N.'s and Mrs. C.'s cases there was found at operation a cyst containing a thick, dark, blood-fluid. The inner surface of the wall of the cyst (Mrs. N.) was of a bright canary-yellow colour and had a granular surface. The wall was a definite structure and a great part of it was removed. Dr. Creed, Director of the Pathological Department, King's College Hospital, reported as follows :—

"The piece of tissue is sarcomatous. The cells are spindle-shaped, and show considerable variation in size. The chromatin network of the nuclei is prominent, and several mitotic figures were seen. There is a fine fibrillary stroma separating the cells. The vessels are badly formed, and in many cases appear to be lined by tumour cells. There has been much extravasation of blood. In addition to the sarcomatous tissue, there are also present one or two fragments of stratified epithelium. The cellular character of the growth, the evidence of nuclear activity and the badly formed vessels leave no doubt as to its sarcomatous nature, but the histological appearances do not suggest that it is a very rapidly growing tumour."

The history of severe injury to the head in all three cases suggests that the cyst was in some way due to injured blood-vessels and was innocent, but in the meantime I am inclined to regard the condition as of low malignancy until there is positive evidence that it is innocent.

*Prognosis.*—The neoplasm is very slow-growing; in Mrs. N.'s case the advanced symptoms did not appear for six years and in Mrs. C.'s case for ten years. The clinical progress of these cases suggests very strongly that these neoplasms will continue to grow and ultimately cause such damage as that found in these two cases, though it may take years to do so. In untreated cases we can imagine even more distressing symptoms than those recorded here. It might be contended on good basis that it would be better to avoid any active treatment of a disease which for many years may not do more than cause some deafness and paralysis of the seventh nerve. Again, it might be suggested that one should wait until the advanced stage before attempting to destroy the disease. Lastly, it might be thought best to adopt a method of treatment that seemed to offer some chance of delaying progress or even of destroying the disease whenever diagnosed. Having watched the clinical progress of these three cases and seen the distressing condition in the advanced stage, I am convinced that the disease should be attacked by operation and radiation as soon as the diagnosis has been made, especially if that diagnosis is clearly supported by X-ray examination. The mistakes made in the operations in the two cases quoted were due, perhaps, to attempting too much. The experience of the operations and the study of the anatomy of the region suggest that our object should be to expose all parts so as to allow the intimate and accurate application of radium, and not to endeavour to remove the whole growth.

The following is a rough plan of the operation which would seem to give the best approach and provide the effective protection afterwards : Make a skin-deep incision,  $\frac{1}{2}$  in. behind the pinna following the curve of attachment of the pinna, and on reaching the point above the pinna extend upwards for about an inch. Another horizontal incision backwards from this point, about the level of the upper limit of attachment of the pinna, will be needed for a free exposure. Reflect the skin and cut a periosteal and muscle-flap with an antero-inferior base by an incision from a point just behind the mastoid process, extending upwards and backwards to about the occipital crest, from this an upward curved incision would be made forward to a point just above and in front of the pinna.

An extensive Schwartz operation would be performed, exposing the lateral sinus, the dura of the posterior fossa, external and internal to the lateral sinus. If not obliterated by disease, the lateral sinus should be blocked off.

In the two cases operated on, the seventh cranial nerve was regarded as destroyed, and therefore not to be considered in the operative procedure. In an early case an endeavour might be made to get between the nerve and the dura to the cyst, and thus perhaps save the nerve. It does not seem necessary to ligature the external carotid artery as was done in these cases.

The radium would be placed in position at the completion of this stage of the operation.

The flap must be carefully protected from the radiation whilst the radium is in position.

In the final plastic operation the upper part of the attachment of the base of flap would be cut through to allow the flap to reach the deep parts of the wound.

The object of this paper was to draw attention to a syndrome common to three cases, and to suggest that it is probable there are other similar cases. As there is a history of severe injury of the head in all three, and as there are more fractures of the base of the skull in recent years, perhaps we may see cases with similar syndrome more frequently.

I have to thank Dr. Creed for his valuable opinion on the microscopic section of the cyst wall, and Dr. Graham Hodgson for his very helpful radiograms.

*Discussion.*—Mr. ALEXANDER TWEEDIE said that Mr. Jenkins had modified his title by drawing attention to the constant and important factor of trauma, whilst the cystic appearance certainly suggested some underlying vascular lesion. Could Mr. Jenkins say whether there was a definite sarcomatous element in the cases in which he had operated?

Of the three cases described, he (Mr. Tweedie) had had the privilege of seeing one in November, 1926, some fifteen months before Mr. Jenkins saw it. The patient had consulted him with regard to tinnitus in the right (affected) ear of about two months' duration. There was then no sign of facial paralysis. On this occasion the appearance of the membrane was similar to that described by Mr. Jenkins, but as there was a chronic nasopharyngitis, palliative treatment was prescribed and further examination of hearing was postponed. However, for conversation, the patient's range for hearing on each side was at that time well up to the standard for his years.

He (Mr. Tweedie) had not seen him again until after he had consulted Mr. Jenkins, when he was able to complete the examination of the auditory and vestibular nerves, and was unable to detect any obvious abnormalities in either. At the same time he had noted that the injected area was mobile with the membrane on aspiration and could be displaced outwards after catheterization. He had only seen the patient about five times since and could not at first detect any alteration except that the facial paralysis had become definitely established. During the last year, however, the hearing had gradually decreased, while more recently the lesion of the membrane had extended. It was important to note, with regard to the character of the lesion, that this patient, even during the present season, was hunting four days a week and tiring three or four horses each day.

These cases must be extremely rare; he (the speaker) had only seen one other. The patient was a heavily built elderly man, living a sedentary life, who consulted him on account of deafness of the old age type. However, he had noticed a similar triangular infiltration and injection of the membrane with its apex at the umbo and its base at the periphery. The patient, when questioned, did not admit any history of accident, but at a second visit, produced a broken bowler hat, which he said was the result of a severe fall on the back of his head on a slippery day. This fall had apparently caused a transient concussion. So far as he (Mr. Tweedie) knew at present, there were no further developments in this case.

The first case Mr. Jenkins had shown constituted a complete claim for the operation performed. The lesion, however, was apparently such a slowly progressive condition that he could not help feeling that the advisability of operation merited careful consideration.

Mr. HAROLD KISCH said he was greatly interested in the syndrome which Mr. Jenkins had described, because he (the speaker) had now under his care a case presenting a somewhat similar nerve involvement, though in this case the disease was tuberculosis of the petrous bone. The patient had come to hospital complaining of hoarseness, and the right vocal cord was found to be paralysed. Projecting from the right external meatus was a large polypus:

there was no pus. The right trapezius was weak, but the patient said that the right side of the shoulder had always been so. The polypus was removed with difficulty, for microscopical examination. There was much bleeding, and the results of the examination were unsatisfactory. It was therefore decided, thinking the condition might be malignant, to explore the mastoid and middle ear. Both mastoid and antrum were normal, but when he (Mr. Kisch) tried to expose the meatus and middle ear it was almost impossible to do so, owing to the mass of material present. He removed the bridge so as to get a better view, and the whole middle ear was seen to be filled, but the appearance did not suggest to him malignant disease. He removed some portions and closed the wound. Sections of the material showed definite giant-cell systems. Dr. Graham Hodgson took skiagrams, without being told the clinical facts, and he reported that the appearance suggested an eighth-nerve tumour. While the patient was in hospital, definite weakness of the right side of the tongue had developed, with weakness of the right side of the palate. The patient had since returned to work, and had been instructed to lead an open-air life. There was still paralysis of the right vocal cord, tongue and palate, though the general health was very much better.

He considered that he was justified in regarding the condition as tuberculosis of the temporal bone, with pressure on the jugular and anterior condylar foramina.

Another case he remembered was one of a man who a few years ago, had a tumour in the middle ear, on the other side of the membrane, and he thought it was malignant. Mr. Wyatt Wynggrave described the portion removed as mes-endothelioma. It was before radium was obtainable at the hospital in any quantity, and the patient was set aside to await his turn for it. He did not turn up when sent for. Seven months afterwards he came with a note from the Middlesex Hospital, where the condition had been diagnosed as an acute mastoid. He had facial paralysis and a large swelling in the mastoid region. He had intracranial involvement, and died shortly afterwards. That case showed that malignant disease of the temporal bone might take a different clinical course from that described by Mr. Jenkins.

Mr. W. A. MILL said that a case of Mr. Layton's which he (the speaker) had seen several times, seemed to be similar to those described by Mr. Jenkins. The patient was a man aged 32, who attended Guy's Hospital because of deafness and complete facial paralysis. That condition had been coming on for ten years, and had gradually become worse. When he had been in the Army during the late war he could not close his eyes. There was middle ear deafness on both sides. As a child he had had suppuration in both ears, and the tympanum showed scarring. He thought that this accounted for the deafness. None of the other nerves was affected. Dr. C. P. Symonds suggested that there might be a growth at the base of the skull, but the skiagram showed nothing abnormal. The Wassermann reaction was negative. There was no history of any head injury. At the moment the case was being watched.

Dr. DAN MCKENZIE said that from the aural—and perhaps also from the general—point of view, Mr. Jenkins had made members acquainted with something new. Still, he (Dr. McKenzie) wondered whether the novelty did not consist in it being approached from the ear standpoint, as in the sister Section a "Hughlings Jackson-McKenzie syndrome" was spoken of, connected with the jugular foramen, and he thought some malignant cases with that syndrome had been described. He did not think, however, that cases had been previously described in which the tumour was in the meatus or the middle ear.

Another point raised by Mr. Jenkins' three cases was the occurrence of facial paralysis in connection with the development of growth; it gave one more point to clear up when meeting with a case of facial paralysis.

With regard to malignant disease of the ear generally, the method of treatment would vary according to the type and situation of the growth. In the "deep" cases, particularly when malignancy was of a mild degree, radium was obviously the remedy indicated. But when epithelioma occurred on such accessible areas as the pinna, removal by diathermy was indicated rather than radium. He had had one or two cases so treated and they had done well. If the disease implicated bone, as in the mastoid, he did not think diathermy was good; all the growth could not be removed by it, and it conferred no advantages over ordinary curetting. In such cases again, radium slowed the rate of growth, and gave much relief from pain.

Mr. T. B. JOBSON asked whether there were any eye changes in Mr. Jenkins' cases, and whether the paralysis was due to actual involvement of nerves, or to pressure on them.

Mr. WATKYN-THOMAS said that evidence in favour of malignancy in the three cases described by Mr. Jenkins was afforded by the differences in their course and in that of the serous cyst of the cerebello-pontine angle. In these serous cysts, which were definitely

non-malignant, the signs were almost entirely intracranial. Many such serous cysts had been described, and he did not think that in any of them had there been involvement of the 10th, 11th, or 12th nerves.

He had seen one case in which diathermy had been used for malignant disease of the middle ear. That was a case of Mr. West's that he had seen early in 1915. He believed that the patient was still alive and without recurrence in 1922.

Mr. JENKINS (in reply) said that there had been a severe injury of the head in all three cases. Dr. Creed had described the tumour as a sarcoma. He advocated operation and radium treatment as soon as the diagnosis was made clear.

### Carcinoma of the Ear.

By E. BROUGHTON BARNES, F.R.C.S.Ed.

ALTHOUGH the title of this paper appears as "Carcinoma of the Ear," I do not intend to include epithelioma of the pinna. Though this seems to be much the commonest form of growth in the ear, it presents no special features and calls only for thorough removal.

I wish to deal with growths arising in the meatus, or deeper in the ear, and with their earliest signs and symptoms, and, particularly, to draw attention to one pitfall in the diagnosis of some of the cases.

My own experience of the condition is limited to three cases, and one of these I saw while I was house-surgeon to Mr. Sydney Scott. I shall cite a few cases from the literature. They are few because (1) I have been under some disadvantage in the search; (2) the condition is rare; and (3) I needed a fairly full report of the history of the case: they are only selected cases in that I have omitted those in which it was not clear what the earliest symptoms were.

I have set out these cases in tabular form, showing a few outstanding resemblances. I shall also attempt to show that they fall into two groups.

The fact that they are not picked is important because of the nature of the growth, which in every case, except two, was reported as a squamous-celled epithelioma. The exceptions were reported as squamous adeno-carcinoma and rodent ulcer.

C. E. West used to call attention to this point and urge therefore that the growth began in the meatus or on the tympanic membrane, even in those cases reported as carcinoma of the mastoid. The ninth case may be regarded as supporting this contention. There was definite thickening of the roof of the meatus with some nodular granulations which appeared suspicious in view of the history. The section report was papilloma. Eleven months later the mastoid was full of growth, with an intact membrane and a meatus apparently normal so far as growth was concerned. Sir Charles Ballance's case supports this view to some extent as showing how readily the mastoid becomes involved. I would suggest, however, that the squamous-celled epithelioma may originate in the mastoid itself in cases with long-standing middle-ear suppuration, since we know that in such cases the epithelium of some part of the mastoid often becomes stratified. In the seven cases in which this point can be considered, five had had long standing aural discharge.

With regard to early symptoms, in these ten cases four symptoms occurred especially frequently—pain, facial paralysis, granulations and a tendency to bleed.

Pain is specially mentioned in nine cases; in every case it was noticeably severe. Facial paralysis occurred in seven of the ten before the patient was examined. In two it was especially stated that the onset of the paralysis coincided with the onset of pain. In two more cases facial paralysis occurred soon after an exploratory operation. There was facial paralysis during the course of the case in nine cases out of ten. In three of the cases in which paralysis was an early sign, it was only partial for many weeks.

Granulations in the meatus were observed in five cases; in three of these there was an unusual tendency to bleed. In one other case, number 6, in which there was meatal swelling, but in which granulations are not mentioned, there was also "excessive bleeding."

It seems probable that the larger number of cases do originate in the altered lining of the mastoid cavities after prolonged suppuration. In these there will be no symptoms at all that can properly be called "early." The most important symptoms that will first draw attention to the condition will be pain and facial paralysis. This paralysis may be incomplete for many weeks, but when these symptoms appear the mastoid is probably already full of growth. This is well illustrated by Sir Charles Ballance's case, which I have included for this reason—although it was one of recurrence in the mastoid after a growth on the pinna—and also by my own case, Case 8. In both these cases there was some irritation of the meatus, followed by pain and paralysis. In both the mastoid was explored immediately after the onset of pain, and found to be full of growth. The growth had completely filled the mastoid before giving rise to symptoms.

Pain and facial paralysis occurring in an ear which is the subject of a chronic otitis must, or at least always ought, I suppose, to lead to an immediate mastoid operation, so that even if the suspicion of malignant disease does not arise, it will be found, if present, by opening the mastoid, without any loss of time. I see no way in which the condition can be diagnosed earlier; the patient will not come to the surgeon, and epithelioma of this group becomes one more terror for the individual who neglects a chronic discharge from the ear.

In the other group—epithelioma arising in the meatus—the position is quite different. These patients have not had a chronic discharge, they have irritation and pain early, and see a surgeon early. I believe, on the strength of two cases, that the pain is due to infection of the growth and skin of the meatus.

In the first of these, the patient, a male aged 43, was shown to the Section by me in 1926. The history was rather unusual.<sup>1</sup> He had had what appeared to be a rodent ulcer in the centre of the forehead in 1922; this was removed surgically. In 1923 the left pre-auricular gland was enlarged. It was treated with radium applicators and disappeared. I saw him in November 1925. He then had a perichondritis of the pinna, thought to be due to radium, and a warty outgrowth in the roof of the meatus. He complained of irritation and pain; there was a discharge from the meatus which was staphylococcal. The warty outgrowth was removed for section and was reported as papilloma. The patient was instructed to report monthly, but the meatal infection cleared up as soon as the papillomatous outgrowth was removed, and he was lost sight of until eleven months later. He returned complaining of pain and partial facial paralysis. The mastoid was explored and found to be widely involved in growth. The section was reported as a rodent ulcer. On the advice of Members of the Section, he was treated by X-rays and afterwards by radium. He is still alive but has had to have repeated treatments with radium. Had I diagnosed the condition correctly in November 1925, he would probably have been cured. The report on the section was unfortunate but I probably took too small a piece.

In the second of these two cases the patient was a woman aged 76. She gave a history of only six weeks. The first symptom was irritation of the meatus, followed three weeks later by pain, and discharge from the meatus. When I saw her she had already seen another aurist and had been treated for a fortnight for staphylococcal dermatitis. The meatus was almost completely blocked by swelling; the discharge gave a pure culture of *Staphylococcus aureus*. The other ear was perfectly healthy. I treated the condition vigorously for three weeks; it was very obstinate and I had to open several small meatal abscesses. At the end of this time there was still a great deal of swelling but I could see the deeper part of the meatus and found on the

<sup>1</sup> *Proceedings*, 1926, xx, 621 (Sect. Otol. 27).

Surgeon	Year reported	Sex	Age	Otorrhea years	History months.	Growth	Symptoms	Notes
1.—Guttmann	... 1929 ...	M. ... 59 ...	Several	9	Squamous	...	Pain, Paralysis } onset together	—
2.—Burton	... 1917 ...	F. ... 48 ...	5	... 6	Squamous	...	Pain, Paralysis } onset together	—
3.—Milligan	... 1911 ...	M. ... 31 ...	27	... 4	Squamous	...	Pain, Gray sloughy polyp. Middle-ear deafness	Paralysis soon after exploratory operation
4.—Milligan	... 1911 ...	T. ... 64 ...	64	... 3	Squamous	...	... Granulations, Free bleeding	—
5.—Parrish	... 1924 ...	F. ... 45 ...	—	39	... 3	Squamous. Adeno- carcinoma	Pain, vascular granulations, paraparesis	—
6.—Sydney Scott	—	F. ... — ...	Many	... 5	Squamous	...	Pain, bleeding, swelling of meatus	Paralysis after exploration. Diagnosed cellulitis of meatus
7.—Guttmann	... 1920 ...	M. ... 60 ...	5 years before for short period	... 6	Squamous	...	... Pain, Paralysis	Paralysis partial many weeks
8.—Barnes	... 1926 ...	M. ... 43 ...	—	—	—	Rodent ulcer. Recurrence	Discharge, dizziness, granulations. Facial paralysis. Sixth nerve palsy	—
9.—Barnes	... 1927 ...	F. ... 76 ...	—	... 1½	Squamous	...	Pain, Mental swelling, staphylococcal dermatitis. Later, growth in mastoid; pain, partial paralysis	Section from meatus reported as papilloma
10.—Ballance	... 1908 ...	M. ... — ...	—	—	Squamous	...	Pain, staphylococcal dermatitis	Meatus only
						...	Irritation in meatus, pain, paralysis	Recurrence in mastoid 3 years after removal of part of pinna

posterior wall, close to the annulus, what appeared to be a nodule of granulations which bled easily and freely when touched. This I removed for section. It showed typical epithelioma. The meatal infection cleared up like magic when this nodule was removed and the patient was left with a wide meatus with a small ulcer in the position in which the nodule had been. I did not think that a frail woman aged 76 would stand any radical procedure and she completely refused to go to London for X-ray and radium treatment. She wore a radium needle in the meatus for ten days. The needle contained 1·3 milligrams of the radium element with a 0·5 millimetre platinum screen. It was further screened at first and maintained in position by wrapping it in sheet lead to 0·5 mm. thickness, and the lead was rolled up into a fair-sized ball in such a way that the needle only just cleared the membrane : it was then enclosed in thin pure rubber. The reaction was very marked and first the rubber and then the lead had to be removed ; even the needle alone caused such pressure that the patient was obliged to have morphia. The needle was in place for ten days, 315 mgm.-hrs. The ulcer rapidly disappeared. After two and a half years this patient is perfectly well, the meatus and membrane appear normal except for a small opaque area in the membrane posteriorly, and the hearing in that ear is at least as good as in the other.

I wish to emphasize strongly the importance, when dealing with meatal infection, of bearing in mind the possibility of growth. In a case of unilateral dermatitis which does not yield to the usual lines of treatment—especially if any tissue resembling granulations can be seen, or if there is unusually free bleeding—an attempt should be made to obtain tissue for section. The failure in my first case will emphasise the importance of taking as much as possible.

I believe that while the cases in which the growth originates within the mastoid will always be in an advanced stage when they are diagnosed, the cases in which it originates in the meatus can be diagnosed very early, provided that we remember the possibility of the condition occurring and are not misled by the accompanying dermatitis.

The growths in the meatus are sufficiently small for most of the tissue to be removed for section. In both my cases the meatal infection disappeared after this had been done, and with the infection, the pain, in the first case so completely that nearly eleven months elapsed before the patient returned. The irritation of which the patients first complained was probably due to the growth, but the pain was due to the severe staphylococcal infection.

#### **Malignant Disease of the Right External Auditory Meatus.— HERBERT TILLEY, F.R.C.S.**

Patient is an adult male. He complains of stabbing pain in the right ear and an occasional but slight discharge. Examination reveals a pale excavating ulcer on the deep antero-inferior wall of the right meatus. The granulations are hard and resisting when probed, but nevertheless bleed freely.

I only saw this patient for the first time last week at hospital and since then he has used peroxide and spirit drops. There is still some ulceration, and he complains of pain, especially when eating. Bare bone can be felt in the antero-inferior region of the meatus but there is no history of suppuration.

*Discussion.*—The PRESIDENT said he would have been sorry to diagnose growth in the meatus in this case. In one or two cases which he had seen there had been minute granulations in the deep meatus, which he feared would be malignant, but on removal they were found to be only inflammatory and disappeared under suitable treatment.

Mr. TILLEY (in reply) said he still felt that this lesion would turn out to be malignant, like some of the cases which Mr. Broughton Barnes had described. He had only seen the patient once before, and did not know whether he had had dermatitis in the meatus in the past. There was no middle-ear suppuration at present. He had only seen such an excavated ulcer in cases which were malignant.

**Malignant Disease of the External Acoustic Meatus and Middle Ear.**

By J. S. FRASER, M.B., F.R.C.S.Ed.

AMONG 646 cases in which the external acoustic meatus was affected, seen in private practice from 1906 to 1929 inclusive, there were three cases of malignant disease of the external meatus, i.e., 0·464%. From the statistical tables of the Department in the Royal Infirmary under the charge of Dr. Logan Turner and myself, compiled by Dr. David Maxwell, one finds that among 6,605 cases in which there was an affection of the external ear and meatus, there were thirteen cases of malignant disease, i.e., 0·197%. If we include two cases classified by Dr. Maxwell as malignant disease of the middle ear, we get fifteen cases in 6,605, i.e., 0·227%.

Of eleven cases observed by myself during the last twelve years, eight were females. The youngest was aged 36 and the oldest 63.

*Case I.*—A. C. Y., male, aged 45, first seen 9.11.18 complaining of shooting pain in the left ear, worse at night, of five months' duration. *Examination*.—The left meatus shows a horny projection on the anterior wall, at the junction of the cartilaginous and bony meatus. After the horny layer had been softened by bicarbonate of soda solution and removed, a small ulcer was exposed, about the size of a pin-head, with a dark red, granular base. External operation was advised but refused. The patient consulted a dermatologist who diagnosed rodent ulcer and advised scraping with a sharp spoon and the application of trichloracetic acid. Neumann's anaesthesia was employed. The microscopical report was "epithelioma" (November, 1918). 24.5.19.—Small recurrence on floor of meatus; again patient only consented to a "scraping" operation (see *Journal of Laryngology and Otology*, 1921, xxxvi, p. 251). 25.7.19.—Recurrence of growth; patient now consents to external operation.

28.7.19.—General anaesthesia; incision behind left ear: bone removed with gouge from meatal wall; incision made in posterior wall of cartilaginous meatus at level of external opening and cartilaginous meatus separated above and below and also in front from the mandibular joint. The sleeve of tissue so formed was then removed (fig. 2). The cavity was lined with a skin graft from the thigh and healed well. 14.11.19.—Patient complains of pain in the left mandibular joint. Examination shows a polypoid growth on the anterior wall of the bony meatus. 24.11.19.—Operation by a general surgeon; vertical incision in front of left ear, turning back below the auricle; parotid gland dissected forward. It was now found that the tumour tissue was invading the parotid and that the case was inoperable. After returning home the patient became a morpho-maniac. Later he had two attacks of erysipelas, spreading from the region of the left ear. Death occurred on 21.4.20.

*Case II* (reported in abstract in *Journal of Laryngology and Otology*, 1921, xxxvi, p. 251).—Mrs. A. C., aged 36, first seen 28.3.19. Patient gave a history of discharge from the right ear in childhood. Two months ago she complained of pain in and discharge from the right ear. On examination the right meatus contained a polypus apparently attached to the roof and posterior wall of the meatus. The polypus bled readily. There was tenderness at the tip of the mastoid. With the noise box in the left ear the patient was not quite deaf. Rotation tests normal.

3.4.19.—Radical operation: the antrum contained only clear, brownish-black fluid; long process of incus absent. On cutting the Koerner flap marked ulceration of its medial end was noted. Granulations were also noted on the anterior wall of the meatus, in its deeper part. The affected portions were entirely excised, and further granulations, or tumour tissue, curedtted from the tympanum and Eustachian orifice. The operation cavity was swabbed out with trichloracetic acid and packed with iodoform worsted. Pathological report: "Squamous epithelioma" (fig. 3). 7.4.19.—Patient has had more pain than usual after the radical operation. 28.4.19.—Radium capsule, like a small date stone (the only available form at this time), inserted into operation cavity; dosage not given. The capsule remained in position for six days. 26.8.19.—Operation cavity looks satisfactory. 24.4.20.—Cavity lined by epithelium. 24.2.30.—Patient's doctor reports that Mrs. Alice C. is alive and well. "The wound is perfect and the cavity is lined by quite smooth epithelium."

*Case III* (reported, in abstract, in *Journal of Laryngology and Otology*, 1925, xl, 600).—D. R., male, aged 55, first seen 4.6.24, with a history of shooting pain in right ear, worse at night, for two and a half years; no deafness. *Examination* showed a red, irregular swelling of the roof of the right external meatus; operation advised but refused. 13.8.24.—

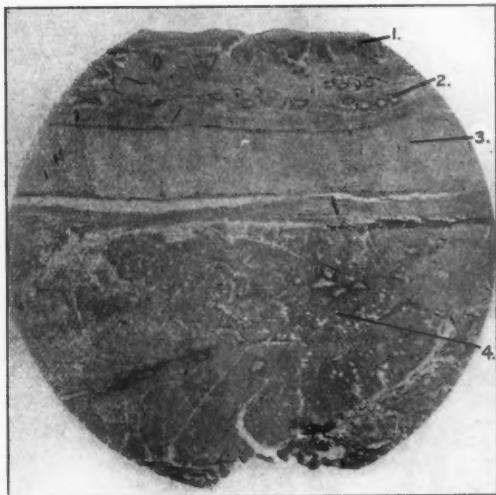


FIG. 1.

× 11.



FIG. 2.

× 11.

**FIG. 1.**—Transverse section through anterior wall of cartilaginous meatus. 1, Superficial epithelium: 2, Ceruminous glands: 3, Cartilage. 4, Parotid gland.

**FIG. 2.—Case I.** 1, Lumen of meatus: 2, Normal squamous epithelium lining meatus: 3, Epithelioma extending towards parotid gland and mandibular joint.



FIG. 3.

× 43.

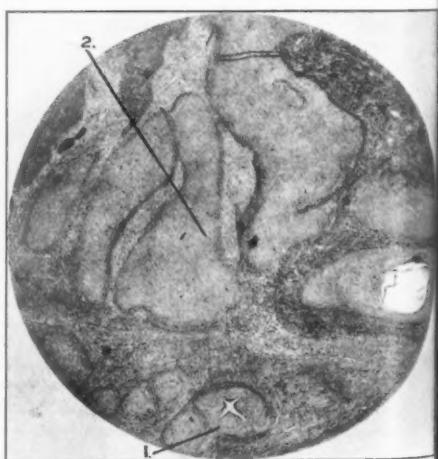


FIG. 4.

× 11.

**FIG. 3.—Case II.** 1, Cell nest: 2, Cell nests showing phagocytosis by leucocytes.

**FIG. 4.—Case III.** 1, Blood-vessel with thickened wall: 2, Invasion of connective tissue by epithelioma.

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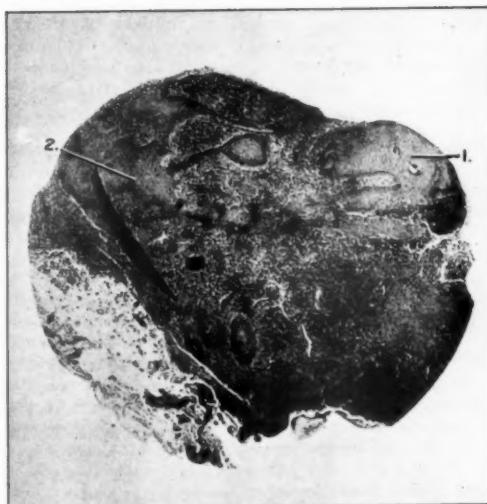
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FIG. 5.

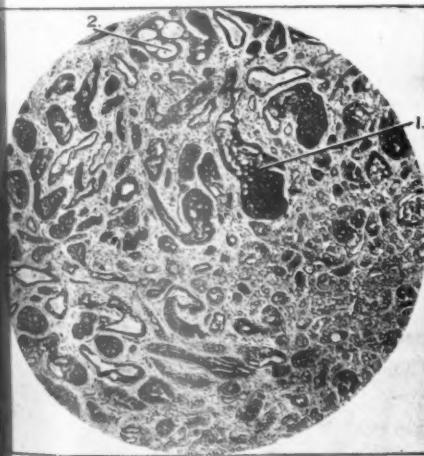
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FIG. 6.

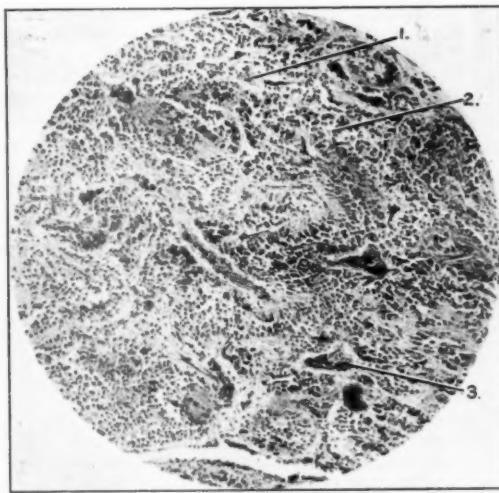
 $\times 75.$ 

FIG. 7.

FIG. 5.—*Case IV.* 1, Superficial epithelium : 2, Malignant infiltration of subepithelial tissue.  
 FIG. 6.—*Case IX.* Malignant adenoma. 1, Almost solid mass of malignant epithelium : 2, Acinus formation.  
 FIG. 7.—*Case XI.* Endothelioma growing from lymph spaces. 1, Delicate connective tissue stroma : 2, Space filled with small endothelial cells : 3, Dilated and congested blood-vessels in stroma.

The pain and meatal swelling have increased; operation consented to. 18.8.24.—Local anaesthesia; piece of tissue removed and reported as "Squamous-celled carcinoma of a slow-growing type" (fig. 4). 28.8.24.—Sleeve operation as in Case I. The disease had penetrated the cartilaginous meatus and the upper part of the drumhead was involved. Radical mastoid operation therefore performed and capsule of mandibular joint exposed; skin graft applied. 20.2.30.—Patient reported by request. Operation cavity dry; no sign of recurrence; hearing reduced to conversation voice at three feet.

*Case IV.*—C. C., male, aged 63, first seen 1.8.24, complaining of pain in, and discharge from, the left ear for several months; the pain radiates to the left side of the throat, and is worse when lying on the ear or clenching the teeth. *Examination.*—There is foul smelling, grumous discharge in the left meatus; an irregular swelling is noted on the anterior wall and floor of the canal. Pathologist's report: "Epithelioma" (fig. 5). 21.8.24.—Sleeve operation; some bone was removed from the walls of the bony meatus but the drumhead was not touched; skin graft applied. 25.8.24.—Mastoid wound was healed; temperature normal. 27.8.24.—Patient dined well and read far into the night; his only complaint to the night nurse was of cramp in the left leg. The nurse, answering the patient's bell at 4 a.m., found him still propped up with pillows but pale and pulseless. *Post-mortem* examination showed heart dilated; the right ventricle contained slightly adherent clot which appeared to have formed before death. A portion of similar clot, about the size of a sparrow's egg, was lying free in the pulmonary artery; this had apparently been detached from the clot found in the right ventricle. The muscle of the heart was generally flabby. *Remarks.*—This is the only case of death from embolism of the pulmonary artery which has occurred in the writer's experience.

*Case V* (case reported in abstract, *Journal of Laryngology and Otology*, 1929, xliv, 764).—Mrs. Annie W., aged 49, first seen 27.1.25 complaining of bleeding from the right ear and pain, worst at night: foul-smelling discharge present. *Examination.*—The right external meatus contains pus and polypus: right ear not totally deaf. 29.1.25.—Radical mastoid operation right ear: tympanum full of tumour tissue (Pathologist's report: "Squamous epithelioma"). 24.7.25.—Right ear is not quite deaf but whole operation cavity is filled with a mass of malignant material. 28.7.25.—Two capsules of radium inserted, each 10 mgm., and kept in position for five days. Patient's doctor reported that after operation the discharge from the ear never ceased and gradually the cervical glands became affected and the whole right side of the neck was filled with a mass of fungating, cancerous growth. She died in January, 1927.

*Case VI.* (case reported in abstract, *Journal of Laryngology and Otology*, 1926, xli, 677).—Mrs. Jean S., aged 48, first seen 30.4.26, gave a history of discharge from left ear since scarlet fever at age of four years: pain in left ear for five months—worse at night; headaches and giddiness for one month. *Examination.*—Foul pus in left meatus: concha excoriated: irregular granular swelling sagging down the superior meatal wall: mastoid tenderness present. Patient deaf with noise box in right ear. No spontaneous nystagmus, Rombergism or pointing error: no fistula symptom: cold caloric test negative. 2.5.26.—Radical mastoid operation: fistula present over antrum with tumour tissue protruding: antrum, aditus and attic full of tumour: prominence of lateral canal eroded: facial nerve lying free in the tumour tissue: promontory and lower part of tympanic cavity almost normal: malleus and incus absent: dura of middle and posterior fossæ exposed by disease and covered by tumour tissue: practically no pus present in middle ear spaces. It was obviously impossible to remove all disease. The pathologist reported "Squamous epithelioma." 7.5.26.—Three radium tubes (5 mgm. each) were inserted and kept in position for three days with gauze soaked in 30% glucose solution. 27.5.26.—Second treatment as above. 28.8.26.—Report received from patient's doctor that she died to-day. Soon after her return amnesia for nouns appeared: this increased rapidly to all vocables and for the last four to six weeks of her life she could hardly speak at all. There was a vague history of fits but her doctor had not seen the patient during any of these. Probably the left temporal lobe was invaded by the tumour.

*Case VII.*—Mrs. M. R., aged 60, first seen 2.9.29 complaining of discharge from both ears for many years. For six weeks there has been bleeding from, and pain in, the right ear, causing loss of sleep. *Examination.*—Right meatus is full of polypoid "granulations" which bleed easily: mastoid tenderness present. Left meatus also shows a polypus. No facial paralysis on either side. Patient is so deaf that hearing tests are not possible. She will not allow vestibular tests. 3.9.27.—Radical mastoid operation (right ear): antrum,

aditus and attic and tympanum full of tumour tissue: malleus and incus absent: the promontory appeared normal but the lateral canal was eroded. The bony wall of the facial nerve was absent above the oval window. (Pathologist reports "rapidly growing squamous epithelioma"). 4.9.29.—Slight facial paralysis: operation cavity looks satisfactory. Left ear discharging very profusely. 14.9.29.—Radical mastoid operation left ear: no appearance of malignancy on this side. 19.9.29.—Four radium needles, each 0.5 mgm., inserted into operation cavity on right side and retained for four days, i.e., 192 mgm. hours. 14.10.29.—Operation cavity on both sides satisfactory. 1.11.29.—*In statu quo.*

*Case VIII.*—Mrs. J. M., aged 57, first seen 4.12.29 complaining of pain in and discharge from the right ear for nine months.

*Examination.*—Bleeding polypus at the inner end of the right meatus. With the noise box in the left ear, the patient can hear fairly well: the vestibular apparatus is normal. 7.1.30.—Radical mastoid operation: mastoid antrum and cells, malleus and incus all normal. Meatal sleeve operation carried out: the bony floor of the tympanum and meatus were eroded by the tumour. Pathological report: "Widespread carcinomatous growth: the type on the whole is that of a squamous epithelioma but in areas there are metaplastic changes from a columnar-celled type: the neoplasm is fairly rapidly growing." 14.1.30.—On the advice of Dr. Woodburn Morison, six radium needles (1 mgm. each) were inserted into the radical mastoid cavity and left in position for three days, i.e., 422 mgm. hours. 28.1.30.—Patient discharged: treatment is to be continued.

*Case IX.* (see *Journal of Laryngology and Otology*, 1929, xliv, 7 p. 63).—Mrs. A. H., aged 62, first seen 11.3.19 complaining of pain in the right ear of fourteen years' duration. The right external meatus was blocked by a neoplasm apparently growing from the posterior wall. 18.8.19.—*Operation:* Free bleeding: the mastoid cells were healthy: whole of posterior wall of membranous and cartilaginous meatus removed, including the tumour: the drum-head appeared normal: cavity packed. Pathologist reports that "The tumour consists of a scanty matrix in which lie large masses of epithelial cells of glandular origin: in places there are signs of acinus formation: conclusion is that condition is one of malignant adenoma probably growing from sebaceous glands" (fig. 6). 29.10.20.—The swelling has recurred but there is no ulceration: the drumhead can be seen. 19.8.23.—Patient still complaining of pain in right ear. 21.12.28.—There is now a large tender swelling behind the right ear and another swelling in front of the auricle: rotation reactions normal. 8.1.29.—General anaesthesia: four radium tubes (each of 5 mgm.) inserted—two behind the ear, one into the meatus, and one in front of the auricle—and retained in position for three days, i.e., 360 mgm. hours. A piece of tumour removed at same time and reported on as "Basal-celled carcinoma of the rodent type: the tumour is of slight malignancy." 7.3.29.—Condition fairly satisfactory. 17.1.30.—Patient reports by request. There is an enlarged gland over the mastoid, at the lower end of the scar. The right external meatus is entirely occluded by growth, which bleeds readily: tenderness is present on pressure over the tragus. 29.1.30.—Radium plaque (10 mgm.) applied over swelling behind right ear and left *in situ* for twenty-four hours. On the following day plaque removed and placed over the swelling in front of the auricle. The case is still under treatment eleven years after the original operation. 9.6.30.—Patient slowly dying.

*Case X.*—Mrs. L. I., aged 47, first seen 22.6.27 complaining of discharge from the left ear for many years, with occasional pain. Patient was recommended by Dr. Walker of Ayr, who suspected malignant disease of the ear. *Examination* showed stenosis of the left meatus: on probing, profuse bleeding occurred: tenderness present over left mastoid but no facial paralysis. With the noise box in the right ear the patient was not deaf. The skin around the auricle was of almost cartilaginous hardness. 28.6.27.—*Operation:* The skin over the mastoid was so brittle that it cracked when the flap was being dissected forward: the periosteum over the mastoid was also infiltrated by tumour tissue. The mastoid bone was softened: there was no pus in the cells or antrum: the dura of the middle fossa was involved by the disease but the malleus and incus were healthy. The cartilaginous and membranous meatus were excised and even then one had not reached healthy tissue. The infiltrated skin behind the ear was excised. The wound was lightly packed and left open. Microscopic report: "In parts the masses of neoplastic cells resemble a basal-celled carcinoma, while in other areas they are commencing to form acini and have the appearance of an adeno-carcinoma." 1.7.27.—Patient has had considerably less pain since operation. 7.7.27.—Radiologist advises treatment by deep X-ray therapy rather than by radium. The patient returned to the Radio-

logical Department on numerous occasions during the remainder of the year 1927 and the early months of 1928. 22.3.28.—Letter received from Dr. Walker stating that the patient died a few days ago. She did not complain of pain or headache after the operation but became mentally affected. She appeared to know what she wanted to say but could not say it. A week before death she became unconscious. The pupil on the affected side was widely dilated. Probably the temporal lobe was invaded by the tumour.

*Case XI.* (case reported in *Journal of Laryngology and Otology* 1912, xxvii, 200 : also 1928, xlivi, 752).—Mrs. L., aged 50, first seen 12.12.10 complaining of pain in the right ear, with deafness, tinnitus, giddiness and facial paralysis of four months' duration. *Examination:* Patient mentally depressed; complete right-sided facial paralysis; smooth, red polypus in meatus; slight mastoid tenderness. Functional tests: Schwabach lengthened; Rinne negative and low tones not heard (right ear); watch heard on right mastoid; raised voice heard at six inches. Slight spontaneous nystagmus to left; rotation tests showed some reduction of irritability of right vestibular apparatus. 26.12.10.—*Radical operation:* mastoid cells and antrum normal; severe bleeding from facial spur; malleus and incus absent; lateral canal and promontory healthy; the polypus was apparently growing from the facial canal. *Pathological report:* "Sarcoma of endothelial type growing from lymph-spaces" (fig. 7). 13.1.11.—Profuse granulations in operation cavity, with blood-stained discharge; patient complains of pain and giddiness. 15.4.11.—Pain and giddiness have disappeared; bleeding has ceased; facial paralysis *in statu quo*. 12.8.11.—General health good; operation cavity has filled up, but is covered by smooth epithelium; occasional pain; with noise apparatus in sound ear, patient is quite deaf. The patient did not report again till 28.12.27, i.e., seventeen years later, when she returned complaining of bleeding from the right ear, pain and giddiness. There was now a hard mass on the right side, below the tip of the mastoid. There was also a swelling of the right tonsillar region and lateral wall of the pharynx. *Examination.*—Ptosis of the right eye; right pupil smaller than left (cervical sympathetic involved); optic discs normal; no paresis of ocular muscles; some loss of sensation on right side of face; complete right facial paralysis and loss of taste on right side of tongue; tongue protruded to right; paralysis of right side of palate and right vocal cord; right sterno-mastoid reduced to thin band and trapezius also wasted; no weakness, incoordination or abnormality of the reflexes in either the upper or lower limbs. 9.1.28.—Patient developed a femoral hernia, and was admitted to a surgical ward; death after operation for hernia.

#### SUMMARY.

*Squamous Epithelioma* (Cases I to VIII).—In eight cases the pathologist's report was "squamous epithelioma." In three of these the disease was confined to the external meatus, when the patients were first seen, and in the earliest of these cases a horny growth was noted on the anterior wall, and after its removal, a small, dark-red granular ulcer was seen. In the other five cases it is probable that the tumour began in the deeper part of the meatus, though the middle ear was certainly involved (in three of these there was a history of chronic middle-ear suppuration). It is of course very difficult to determine in some cases whether the malignant disease began in the deeper part of the external acoustic meatus or in the tympanic cavity. These five patients did not present themselves till the meatus was occluded by dark-red, granular polypi, which bled easily. In two cases the periauricular glands were enlarged, and in one of these the facial nerve was already paralysed and the mastoid infiltrated.

*Symptoms.*—In all of these cases pain, worst at night, was the most marked symptom: in three it was mentioned that the pain shot over the face on the affected side, and that the patient could not lie on this side at night. Discharge was present in six cases. Only one patient complained of giddiness.

*Treatment.*—One patient would not at first consent to external operation but, on the advice of a dermatologist, allowed a "sharp spoon" operation through the meatus with the aid of local anaesthesia. Only later, when the disease recurred, would he submit to a retro-auricular incision with removal of a sleeve of tissue comprising the whole of the cartilaginous and membranous meatus. Unfortunately the disease

had by this time spread to the parotid gland, and the patient became a morphomaniac before his death from erysipelas. In another case the "sleeve" mentioned above was removed, but the patient died a few days later from pulmonary embolism.

A third patient, in whose case the radical mastoid operation with skin graft was performed, is alive and well six years after operation. Another patient is alive and free from disease eleven years after operation. Two recent cases are still under treatment, while the remaining two patients have died after recurrence of the growth, one from cancerous toxæmia, and the other most probably from involvement of the temporal lobe due to cancerous invasion.

*Malignant Sebaceous Adenoma* (Cases IX and X).—There were two cases of this type, both in females over 46 years of age, complaining of pain and blood-stained discharge—in one case of fourteen years' duration. In both there was a neoplasm in the meatus and the radical mastoid operation was performed, with removal of the cartilaginous and membranous meatus. The pathologist reported "malignant adenoma growing from sebaceous glands." One patient is alive but, in spite of radium therapy, suffers from recurrence of the tumour eleven years after operation. In the other case the skin over the mastoid, the mastoid bone, and the dura mater of the middle fossa were all involved at the time of operation and, in spite of deep X-ray therapy, the patient died from invasion of the temporal lobe by the tumour.

*Endothelioma*.—The remaining case (XI) was one of endothelioma in a female aged 50. Pain, tinnitus, giddiness and facial paralysis were all noted on admission. A polypus which bled easily was present. The radical mastoid operation was performed. Seventeen years later the patient was sent back by her doctor, and it was then found that the 5th, 7th, 8th, 9th, 10th, 11th and 12th nerves were all paralysed on the affected side. Death occurred after an operation for femoral hernia.

#### CONCLUSIONS.

The early diagnosis in cases of malignant disease of the external acoustic meatus is of the greatest importance. If the patients come early, when there is only a small ulcer in the external meatus, possibly covered by a horny layer, and if at this stage they are willing to submit to post-aural operation with excision of a "sleeve" of tissue containing the cartilaginous and membranous meatus, possibly also with removal of some bone from the meatal wall, the prognosis is good. Even if the tympanic cavity is involved, the chances of cure are at least fair if a radical mastoid operation is performed and radium treatment carried out. On the other hand, in cases in which the whole of the mastoid and even the skin covering the mastoid, are involved, even the most extensive operation followed by radium treatment or deep X-ray therapy offers little or no hope of recovery.

[The writer begs to acknowledge a grant from the Carnegie Trust of Scotland to provide the illustrations for this paper.]

**Microscopical Sections from a Case of Endothelioma arising in connection with a Nævoid Angioma.**—Sir JAMES DUNDAS-GRANT, K.B.E., F.R.C.S.

The patient, a man then aged 29, was shown to the Section in November, 1924.<sup>1</sup> He was first seen in July, 1924, on account of deafness in the right ear and attacks of giddiness from which he had suffered for over a year.

I found a smooth, red swelling, which was pulsating and resilient, and bleeding when manipulated. There was considerable lowering of the labyrinthine reactions on the right side and almost complete loss of hearing.

Microscopical examination of a portion was reported by Dr. Carnegie Dickson to show endothelioma arising in connection with a nævoid angioma. With Mr. Ormerod's assistance I removed it freely by the mastoid operation.

<sup>1</sup> For full report of case to that date see *Proceedings*, 1924, xviii (Sect. Otol. 3).

Two months later the patient felt well, but there was a small elastic swelling in the postero-inferior part of the tympanum; this was punctured with the galvanocautery point and again with the zinc electrolytic needle.

On November 11, 1924, I removed a portion for microscopic examination, and there were found none of the alveolar masses of cells suggestive of endothelioma, but the nævoid vascular spaces were present, and at one extreme corner of the specimen there was a proliferation of the surface squamous epithelium suggestive of a low grade of malignant infiltration of the deeper tissues.

November 18, 1924.—A tube of radon (17 millicuries with 0·3 mm. platinum filtration) was introduced into the growth and left for ten hours. Next day the growth was quite white, less resilient and less tender. Reaction showed itself by the formation of a thick, white pultaceous exudate adherent to the walls of the deepest part of the meatus. It consisted of necrotic and scab-like material without any sign of actively growing epithelial or other tumour cells.

In May, 1925, the patient reported that he had had for the last two months no pain except a little smarting after introducing alcohol drops. Dr. van Voorthuijsen had examined him, in Java, and had found no trace of the tumour.

#### **Microscopical Section from a Case of Epithelioma of the External Auditory Meatus.—Sir JAMES DUNDAS-GRANT, K.B.E., F.R.C.S.**

The patient was a middle-aged man, seen in 1899, who complained of pain in the ear. On inspection there appeared to be simply a swelling of the cutaneous lining. Subsequently a granulation developed. The probe revealed a remarkably extensive area of bare bone on the posterior wall of the meatus. I removed a portion of the sprouting tissue for microscopical examination, and it proved to be epitheliomatous, as seen in the section exhibited. Symptoms eventually developed which led a surgeon to explore for cerebral abscess. A frozen section made at the time of the operation, however, confirmed the diagnosis of "typical epithelioma."

In a case seen with the late Sir James Cantlie I found the same "granulation" formation, also with an extensive area of bare bone. The granulation was found to consist of epitheliomatous tissue with the same sequence of events.

#### **Malignant Disease of Right Ear.—T. JEFFERSON FAULDER, F.R.C.S. Mrs. M. C. aged 46.**

History of ten years' discharge from right ear, becoming painful recently.

September, 1929.—Ear contains much pus. Two sequestra removed. Furunculosis.

November, 1929.—Radical mastoid operation. Bony meatal wall, bridge, and facial spur necrosed and deficient. Much granulation tissue in cavity and on sigmoid sinus. Microscopical report on tissue: Squamous carcinoma.

December, 1929.—Wide excision of lower half of auricle and surrounding tissue.

February, 1929.—Extensive local recurrence treated by diathermy and insertion of 52 mgm. radium for ninety-four hours (4,888 mgm. hours).

#### **Carcinoma in External Acoustic Meatus: treated by Radium.— GILBERT CHUBB, F.R.C.S., and F. C. ORMEROD, F.R.C.S.**

Miss E. C., aged 51.

Deafness and otorrhœa following measles in childhood.

Severe earache (right) since July, 1928. Noticed a growth in the right ear since July, 1928.

Portion of growth removed in December, 1928—squamous-celled carcinoma. Admitted to Westminster Hospital, January 5, 1929; pain getting more severe. A wart-like growth springing from antero-inferior part of meatal wall and practically filling meatus. No glands palpable in region of right ear.

January 7, 1929.—Five needles, each containing 1·3 mgm. radium, were inserted into the wall of the meatus on the superior, posterior and inferior aspects

January 16, 1929.—Radium removed. Total 1,404 mgm. hours. The growth and pain disappeared in about a month and there has been no recurrence.

**Epithelioma in Left External Meatus : treated by Radium.**—GILBERT CHUBB, F.R.C.S., and F. C. ORMEROD, F.R.C.S.

Miss A. H., aged 42.

April, 1926.—Sent from municipal hospital.—*History* : Twelve months' foul discharge from left ear, bleeding for six months and sharp shooting pain at times. Meatus occluded by a reddish polypoid growth springing from antero-inferior portion of wall. Portion removed and reported as epithelioma.

May 17, 1926. Westminster Hospital.—Growth removed together with anterior wall of meatus, tragus and portion of parotid. 15 mgm. of radium inserted and left in for 3 hours (dose 45 mgm. hrs.) Dissection of glands of neck at same time.

During the third week marked signs of labyrinthine irritation occurred ; giddiness, vomiting and nystagmus. The patient was drowsy, temperature rose to 101° F. and there was some papilloedema on the same side. A radical mastoid operation was performed with subsidence of all symptoms.

November 11, 1926.—Patient was readmitted with a very extensive recurrence at the site of the original growth.

15·2 mgm. radium were inserted for 71 hours and the growth disappeared extremely rapidly (dose 1079·2 mgm. hrs.).

Six months later the patient was apparently free from malignant disease in the ear, but she had marked cerebr al symptoms ; she was suffering from amnesia, was having fits, and was unable to speak properly. There was involvement of the temporal lobe by the malignant disease. Presumably the patient has died.

**Secondary Carcinoma of the Middle-ear involving the Dura Mater.**—W. M. MOLLISON, M.Ch. (President).

This case was shown at a meeting of the Section in December, 1928. The growth in the ear was apparently secondary to carcinoma of the right breast which had been removed three years previously.

For the aural history see *Proceedings*, 1929, xxii, 687 (Sect. Otol., 39, 40).

The patient had ninety minutes' radiation treatment (in three doses) in November, 1928, and a further similar dosage in January, 1929.

January 30, 1930.—The mastoid was healed and the pain in the ear had ceased.

The patient was distinctly dyspnoeic and it was feared that there were secondary deposits in the chest. A skiagram showed thickening at the base of the right lung (? growth) and fluid.

February, 1930.—Two radiations.

Healing—that is to say, disappearance—of secondary deposits must be very rare. I think the deep X-ray therapy takes the credit for the disappearance in this case so far as the ear is concerned.

A point of interest was the early appearance of facial paralysis (*Proceedings*, loc. cit.). This was also a striking symptom in a case of Mr. Sydney Scott's which I saw.

**Rodent Ulcer in the External Auditory Meatus.**—W. M. MOLLISON, M.Ch. (President).

Mrs. P., aged 67, was referred to me by Dr. H. D. Apergis in June, 1929. She complained of intermittent pain in the left ear, of perhaps a year's duration. In 1928 she consulted a doctor on account of a pricking in the ear, but he said that nothing

but wax was present. The hearing was and is normal. On examination an area in the floor of the meatus was seen to be covered with a hard scale of "wax," which could not be removed without hurting the patient. Later, a diagnosis of rodent ulcer was made, as a distinct ulcer was apparent.

The patient was referred to the Radium Institute, where she was treated by Dr. Gosse.

She was not seen again by me until January, 1930, when it was found that the ulceration was nearly healed, only a very small crater being left, but on the anterior wall of the meatus was a crust such as is so often seen on rodent ulcers elsewhere; this crust could be removed but only with difficulty.

Dr. Gosse gave another dose of radium and twelve days later the little crater had disappeared and the meatal wall was sound.

Dr. Gosse said he could not remember having seen a previous case of rodent ulcer in the external auditory meatus.

## Section of Pathology.

[May 20, 1930.]

### Tuberculous Lesions, Healed and Active, met with during Post-mortem Examinations in South Australia, and their Significance.

By J. BURTON CLELAND, M.D.

(Professor of Pathology, University of Adelaide; Honorary Pathologist, Adelaide Hospital).

IT has been the practice for some years in the Pathological Department of the Adelaide Hospital to keep, by means of cards, a special record of the presence, or otherwise, of tuberculous lesions in every autopsy in which the examination has been sufficiently complete. These cards are in three colours: white, on which the negative cases are entered, with the cause of death; blue, on which an entry is made whenever a tuberculous lesion, healed or active, of any size is met with; salmon-coloured, on which cases are entered in which lesions are present which may possibly be tuberculous. In every case other important lesions met with are entered on the card; the age and sex of the patients are also noted, as well as their nationality, and the length of time they have been resident in Australia. As the numbers accumulate it is proposed to sum up, from time to time, the information obtainable from these cards. In this way important information may be obtained as to the incidence of tuberculosis in Australia, the number of cases in which complete healing has occurred, the association of tuberculous lesions with other pathological conditions, or perhaps the relative freedom of certain tuberculous persons from other diseases, the distribution and extent of tuberculous lesions, and whether the Australian-born is or is not more liable to tuberculosis than the British-born elsewhere.

The autopsies are carefully made, and if it is felt that the examination has not been sufficiently complete from the point of view of showing complete freedom from old tuberculous foci, such a case is discarded and not entered up. The smallest area of calcification of a bronchial or mediastinal or mesenteric gland is considered evidence of a previous tuberculous focus in which complete healing has taken place. Definite scarring with calcified specks in the lung is considered also as being of tuberculous origin, unless circumstances point otherwise. Purely surface thickening of the pleura at or near the apex of the lung is not necessarily considered tuberculous unless it extends into the substance of the lung. As the tissues of the neck cannot be examined without leading to the disfigurement of the body, it is possible that occasionally, old tuberculous foci in the cervical glands may have been overlooked. Taken altogether we can, however, say that though doubtless a number of examples of completely healed tuberculosis have been missed owing to the difficulty entailed in searching all the lymph glands, nevertheless the lesions thus missed were so insignificant that they cannot be considered as having affected the health of the patient.

At the Medical Congress held in Dunedin in 1927 (Supp. to the *Med. Journ. of Aust.*, November 26 and December 3, 1927) I submitted the results of the first 800 autopsies in which this card system had been adopted. The present series deals with 500 further cases, 433 from the Adelaide Hospital and 67 from the Parkside Mental Hospital. In this series the number of cases in which no evidence of tuberculosis was detected is less than in the previous series, being only 53·4% as against 66%, and the number in which tuberculosis, healed or active, has been found is correspondingly increased from 27·7% to 41%.

The consideration of the data obtained from these cards shows the relative incidence of various lesions in tuberculous patients, the most usual sites of healed lesions, and other similar information. These data should also furnish evidence indicating whether immunity develops as a result of a tuberculous infection having been overcome. There is a general impression that, as our years advance, we become less liable to tuberculosis owing to our having acquired, through repeated sub-infections, an artificial immunity. It has been thought that the savage not thus exposed to

frequent sub-infections, possesses no such acquired immunity, and consequently is a ready victim when exposed to association with Europeans. Some authorities are of opinion that tuberculous lesions met with in adults who have had no previous immunization, present features differentiating them from the reactions in the relatively immune. Many hold that the administration of tuberculin helps in overcoming the tuberculous invasion. If tuberculin is thus advantageous, still more advantageous should be the overcoming and complete healing of a tuberculous lesion, a result which would give rise to more or less permanent immunity—if such can be acquired in this disease. It has therefore seemed well to review the data from this aspect and see whether the information supplied bears out the above theory, or whether no evidence of immunity can be shown.

We find that in more than half (in 53·4%) of the post-mortem population of Adelaide, there is no evidence discoverable at all of the patient ever having had tubercle bacilli established in his body. They may have become established in some or in many of these cases, but if so, they were evidently readily overcome—and this at an early stage—leaving behind no noticeable lesion.

We find that 41% have been definitely attacked by the tubercle bacillus. In nearly half of these (in 19·8% of the total cases) the tuberculous lesion has been completely overcome, as shown by calcification. In 17·8% of the total, active tuberculous lesions were present and in 3·4% healing or quiescent lesions were alone detected. Obviously we must look on the healed lesions as being primary infections which have been successfully overcome, so that in nearly half of those persons in whom the tubercle bacilli are able to establish themselves, these organisms are successfully overcome at an early stage. For this to occur we must infer that the tubercle bacilli were of little virulence, or that the number of organisms gaining entrance were small, or that the tissues of the host were able, owing to a natural resistance, to overcome the infection before it could spread or to chance favouring circumstances, or there may be a combination of these various factors.

A tuberculous focus having been thus overcome, is the individual concerned protected against later introductions of living tubercle bacilli? In the 89 cases of active tuberculosis, old healed calcified tuberculous lesions, long antedating the active lesions, were found in 15, i.e., 16·6%, showing that a tuberculous invasion had been successfully overcome probably many years previously. Healed lesions were thus detected in  $99 + 15 = 114$  of the 500 cases, i.e., in 22·8%, and they were present in 16·6% of the actively tuberculous. It does not seem as though the presence of a perfectly healed tuberculous lesion afforded the individual concerned any high degree of protection.

TABLE I.—DETAILS OF THE TOTAL CASES.

Of 500 cases :—							
No evidence of tuberculosis	...	...	...	267	...	(53·4%)	
Lesions small and doubtful, some perhaps tuberculous, others not—if tuberculous, classifiable as healed	...	...	...	28	...	(5·6%)	
Showing evidence of tuberculosis, healed or active	...	...	...	205	...	(41%)	
Of the 205 tuberculous cases :—							
Active	...	...	...	89			
Extensive pulmonary tuberculosis (mostly the cause of death)	...	...	...	61			
Moderate pulmonary tuberculosis (not the cause of death)	...	...	...	11			
Active tuberculosis not primarily pulmonary	...	...	...	17			
				89			
Healing or quiescent and small	...	...	...	17			
Healed	...	...	...	99			

Of the 89 cases of active tuberculosis, in 15 (16·6%), healed lesions (calcification) in other parts showed that a tuberculous lesion there had been overcome.

TABLE II.—DETAILS OF THE ASSOCIATED TUBERCULOUS LESIONS IN PATIENTS WITH EXTENSIVE PULMONARY TUBERCULOSIS (61).

Extensive pulmonary tuberculosis only	17
Extensive pulmonary tuberculosis + ulcers of intestine	8
Extensive pulmonary tuberculosis + ulcers of intestine + calcification in bronchial glands, etc.	2
Extensive pulmonary tuberculosis + calcification in bronchial glands	2
Atypical pulmonary tuberculosis + calcification in bronchial gland	1
Extensive pulmonary tuberculosis + caseation in bronchial glands	4
Extensive pulmonary tuberculosis + ulcers of intestine + calcification of mesenteric glands	2
Extensive pulmonary tuberculosis + ulcers of intestine + calcification of mesenteric glands + tuberculous laryngitis	1
Extensive pulmonary tuberculosis + ulcers of intestine + caseation of mesenteric glands	1
Extensive pulmonary tuberculosis + ulcers of intestine + tuberculous laryngitis	4
Extensive pulmonary tuberculosis + tuberculous laryngitis + extension to pericardium	1
Extensive pulmonary tuberculosis + tuberculous laryngitis + caseous tracheo-bronchial gland	1
Extensive pulmonary tuberculosis + tuberculous laryngitis (early) + early ulcers of intestine + calcified speck in bronchial gland + tubercles on pleura	1
Extensive pulmonary tuberculosis + ulcers of intestine + caseous cervical, mesenteric and mediastinal glands	1
Moderate pulmonary tuberculosis with miliary spread + calcified glands of neck	1
Extensive pulmonary tuberculosis + tuberculous meningitis	1
Extensive pulmonary tuberculosis + ulcers of intestine + tuberculous meningitis	1
Extensive pulmonary tuberculosis + ulcers of intestine + tuberculous meningitis + caseous focus in bronchial gland	1
Extensive pulmonary tuberculosis + miliary tubercles in liver	1
Extensive pulmonary tuberculosis + ulcers of the intestine + tuberculous peritonitis + tuberculous pericarditis	1
Extensive pulmonary tuberculosis + ulcers of intestine + warty mitral endocarditis	1
Extensive pulmonary tuberculosis + ulcers of intestine + sinus, ? tuberculous, near mastoid	1
Primary tuberculosis of pleura (?) with effusion. Silicosis	1
Extensive pulmonary tuberculosis + ulcers of intestine + calcified bronchial gland + tuber- culous epididymis, prostate, bladder	1
Extensive pulmonary tuberculosis + ulcers of intestine + tuberculous laryngitis + tuberculous epididymis, prostate, bladder + tuberculous kidney	1
Extensive pulmonary tuberculosis + ulcers of intestine + calcified speck in mediastinum + tuberculous epididymis + tuberculous kidney	1
Extensive pulmonary tuberculosis + ulcers of intestine + abscesses of sternum and ribs + tuber- culosis of dorsal vertebrae + tuberculous peritonitis + tuberculous suprarenal, prostate + miliary tuberculosis	1
Extensive pulmonary tuberculosis + tuberculosis of dorsal vertebrae + tuberculous Fallopian tubes + specks in mesentery	1
Extensive pulmonary tuberculosis + tubercles in tracheo-bronchial gland + tuberculous ulcers of intestine + suprarenal calcification	1
	61

TABLE III.—SUMMARY OF THE ASSOCIATED LESIONS MET WITH IN EXTENSIVE PULMONARY TUBERCULOSIS (61).

Tuberculous ulcers of the intestine present in	30
Tuberculous laryngitis present in	9
Calcified bronchial or mediastinal glands present in	8
Calcified mesenteric glands present in	2
Calcified cervical glands present in	1
Tuberculosis of epididymis present in	3
Tuberculosis of the prostate present in	3
Tuberculosis of kidney present in	2
Tuberculosis of suprarenal present in	2
Tuberculosis of Fallopian tubes present in	1
	61

TABLE IV.—SUMMARY OF THE ASSOCIATED LESIONS IN MODERATE PULMONARY TUBERCULOSIS.  
DEATHS DUE TO OTHER CAUSES (11).

Moderate pulmonary tuberculosis	9
Moderate pulmonary tuberculosis + calcified bronchial glands	2

TABLE V.—*LESIONS IN ACTIVE TUBERCULOSIS NOT PRIMARY PULMONARY* (17).

Cerebellum. Tuberculoma	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Mesenteric gland. Caseating and fibrosing	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Prostate, yellowish area. Lumbar glands large and firm; tuberculous meningitis	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Tracheal and left iliac glands. Tuberculous meningitis. Miliary tuberculosis of spleen and diaphragm	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Bronchial glands, both sides, caseous. Miliary tuberculosis of peritoneum, lungs, pleurae, spleen, liver, kidneys	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Right kidney, caseous mass. Tuberculous meningitis. Small (?) tuberculous ulcer of ileum	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Small caseous foci in left bronchial glands, extensive tuberculous peritonitis with many miliary tubercles. Fine cirrhosis of liver	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Fibrosing tuberculosis of prostate, etc. Tuberculosis of right epididymis. Miliary tuberculosis of lungs, spleen, liver. Tuberculous meningitis	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Sacro-iliac tuberculosis with sinuses to groin. Cavities at both apices with some caseation, slight lymphatic infiltration. A few caseous spots in tracheo-bronchial glands. Caseous focus in epididymis. Tuberculous meningitis, advanced	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Tuberculosis of bodies of dorsal vertebrae, cold abscess bursting into pleura. Both lungs fibrosed at apices with cased foci. Both suprarenals tuberculous. Fibrosed tuberculosis of each epididymis. Healed ulcer of oesophagus, ? from tuberculous gland	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Left kidney sac of thick pus, right, with two foci of tuberculous pyelonephritis (guinea-pig negative). Tuberculosis of vesicle. Healed tuberculous hip. Sac with cheesy pus in front of upper dorsal vertebrae probably from cervical vertebrae	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Caries of lumbar vertebra, secondary abscess, infected from colon, between spleen and kidney.	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Tuberculous kidney. Small calcified or caseo-calcified areas at both apices	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Cervical caries. Organized lung with, microscopically, tuberculosis	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Tuberculous hip and abscess	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Number of tuberculous nodules in peritoneum. Extensive racemosous pulmonary tuberculosis. Tuberculous ulcers of intestine. ? Tuberculous focus in kidney. Adhesive-haemorrhagic (?) pericarditis	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Tuberculous peritonitis, tuberculous mesenteric glands, calcified or caseous foci in liver and spleen and caseation of vesicles and miliary tubercles in lungs	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Tuberculous peritonitis, tuberculous Fallopian tubes and uterus, caseous foci in left upper lobe of lung (death from acute dysentery)	...	...	...	...	...	...	...	...	...	...	...	...	...	1

TABLE VI.—*LESIONS IN HEALING OR QUIESCENT TUBERCULOSIS* (17).

Caseous mesenteric glands	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Fibro-caseous area in left bronchial gland. Small scar near right apex	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Left iliac gland, small caseous focus size of swollen pea	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Right apex, caseous patch size of wheat grain with a little scarring	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Caseous focus at apex	...	...	...	...	...	...	...	...	...	...	...	...	...	1
In both upper lobes small calcareous nodules in dense fibrosis. Extensive silicosis	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Right suprarenal, caseous with fibrosis around. Caseous sacs in anterior peritoneal wall and pericardium, (?) tuberculous	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Small caseous foci scattered through lung	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Small tuberculous foci in lungs and glands	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Small caseous foci in bronchial glands	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Some small caseous foci and (usually) some tubercles in lungs	...	...	...	...	...	...	...	...	...	...	...	...	...	4

TABLE VII.—*SUMMARY OF LESIONS IN HEALED TUBERCULOSIS* (99).

Bronchial, tracheal or mediastinal glands only, calcified specks	...	...	...	...	...	...	...	...	...	...	...	...	...	25
Bronchial and mesenteric glands, calcified specks	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Bronchial gland + pea-sized calcified nodule in spleen	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Lungs (scarring, fibrosis or calcified specks) + calcified specks in bronchial or mediastinal glands	...	...	...	...	...	...	...	...	...	...	...	...	...	20
Lungs only (scarring, calcified areas, etc.)	...	...	...	...	...	...	...	...	...	...	...	...	...	37
Calcified mesenteric glands	...	...	...	...	...	...	...	...	...	...	...	...	...	10
Calcified mesenteric gland + caseation (?) in tracheal gland	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Calcified mesenteric gland + small caseous area near Fallopian tube	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Calcified mesenteric gland + calcified gland near iliac artery	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Kidney—thick caseous pus in fibrous tissue + near left apex in pleura, group of small fibrosed tubercles (?)	...	...	...	...	...	...	...	...	...	...	...	...	...	1

99

TABLE VIII.—*DETAILS OF HEALED TUBERCULOUS LESIONS IN BRONCHIAL, TRACHEAL OR MEDIASTINAL GLANDS ONLY* (25).

Right bronchial gland, small calcified areas 8; small caseous foci 1	...	...	...	...	...	...	...	...	...	...	...	...	...	4
Left bronchial gland, calcified specks 2; caseous focus, small, 1	...	...	...	...	...	...	...	...	...	...	...	...	...	3
Bronchial gland, side unspecified	...	...	...	...	...	...	...	...	...	...	...	...	...	9
Mediastinal gland	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Tracheal gland, calcified, one size of marble	...	...	...	...	...	...	...	...	...	...	...	...	...	3
Bronchial and tracheal glands	...	...	...	...	...	...	...	...	...	...	...	...	...	3
Left bronchial and anterior mediastinal glands	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Tracheo-bronchial gland and lungs (?) calcified areas in glands	...	...	...	...	...	...	...	...	...	...	...	...	...	1

25

TABLE IX.—DETAILS OF HEALED TUBERCULOUS LESIONS IN LUNGS + BRONCHIAL OR MEDIASTINAL GLANDS OR OTHER PARTS (CALCIFIED SPECKS) (20).

Calcified specks or nodules in bronchial or mediastinal glands + scarring, fibrosis, etc., at one apex or calcification or thickening of pleura	...	...	...	...	...	9
Calcified specks or nodules in bronchial or mediastinal glands + both apices as above	...	...	...	...	...	4
Calcified specks or nodules in bronchial or mediastinal glands + calcified nodules in lungs other than at apex	...	...	...	...	...	3
Fibrotic mediastinal gland with slight caseation, very indefinite scarring at right apex	...	...	...	...	...	1
Small calcified nodules in lung, spleen, liver (4)	...	...	...	...	...	1
Calcified speck in lower lobe + calcification in bronchial gland	...	...	...	...	...	1
Scar and calcified area at right apex + calcified nodule in lower part of left upper lobe + calcification of retroperitoneal glands and glands near liver	...	...	...	...	...	1
						20

TABLE X.—DETAILS OF TUBERCULOUS LESIONS IN LUNGS ONLY (37).

Right apex. Fibrosis, scarring, a small calcified area or small caseo-calcified focus	...	...	...	...	...	6
Left apex. Fibrosis, scarring, a small calcified area or small caseo-calcified focus	...	...	...	...	...	5
Both apices (one with small cavities and scarring)	...	...	...	...	...	9
Apex (not specified)	...	...	...	...	...	6
Apex, left lower lobe, calcification and scarring	...	...	...	...	...	1
Right lung, small calcified nodule	...	...	...	...	...	1
Posterior part of right lower lobe, calcified specks in outer part	...	...	...	...	...	1
Right apex scarring, a few calcified nodules scattered in both lungs	...	...	...	...	...	1
Calcified scar at apex, calcified gland adherent to pericardium	...	...	...	...	...	1
Small calcified nodules in both upper lobes	...	...	...	...	...	1
Left lower lobe, small calcified speck	...	...	...	...	...	1
Small calcified area in front part of left lung	...	...	...	...	...	1
Calcified specks in right lung, one in middle of upper lobe, one on pleura of lower lobe	...	...	...	...	...	1
Scars at both apices and scattered small fibrotic foci in upper lobes and calcified speck in left lower lobe	...	...	...	...	...	1
Small scar, right apex. Small hard patch in fissure between upper and middle lobes	...	...	...	...	...	1

37

### Malignant Growths and Tuberculosis.

By J. BURTON CLELAND, M.D.

(Professor of Pathology, University of Adelaide, Honorary Pathologist Adelaide Hospital).

CONSIDERABLE interest has lately been taken in the subject of malignant growths and tuberculosis. Whilst deaths from the latter have diminished, those from the former have almost correspondingly increased. We rarely find a malignant growth present in a patient who has died from tuberculosis, but this is hardly to be wondered at, inasmuch as a malignant growth nearly always occurs in elderly persons and kills the patient in the course of a year or so, and patients who are going to die from tuberculosis are mostly younger than the "cancer age," and likewise tend to succumb quickly to the disease. It is not proposed to review the literature of the subject here, the object of this communication being merely to make public some interesting results—requiring much amplification to confirm them beyond question—which have emerged from the study of our post-mortem records in the Adelaide Hospital and the Parkside Mental Hospital, South Australia.

The present paper deals with the incidence of malignant growths in 1305 post-mortem examinations from the point of view of their association, or otherwise, with tuberculosis. In Table I, the ages of the patients are given in decennial periods. As regards tuberculosis, the cases have been grouped into those in which no lesion, however small, suggestive of tuberculosis could be found (tuberculosis negative); those with active tuberculosis, such as did cause or would probably soon have caused death; in those with slight or quiescent tuberculous lesions, the patients not dying from tuberculosis; those with quite healed tuberculous lesions, such as calcified specks in a bronchial gland or calcification of mesenteric glands; those in which there were slight indefinite lesions, which might possibly have had a tuberculous origin, such cases if really tuberculous evidently coming under the category of "healed."

Then, under each of these groupings are recorded the number of cases in which there was no malignant growth, and the number in which such growth was present. Sarcoma, as well as carcinoma, is included in the tables, under the term "cancer," which is taken here as meaning a malignant neoplasm. Gliomata and such rare neoplasms as endotheliomata are also included, but, with the exception of the true carcinomata, these other forms of malignancy are almost negligible in number. In the eight instances of malignant growths in patients under the age of 30 (all of them in-patients, who showed no evidence of active or healed tuberculosis), three were gliomata, but two were typical carcinomata (of the stomach and of the rectum).

In Table II the arrangement is altered and the only cases considered are those in which the patients have reached the "cancer age," that is from 41 onwards. The cases are grouped under "tuberculosis negative," "tuberculosis healed" and "tuberculosis active (including quiescent)." The total number of cases is given for each of the decades, and, in brackets, the number of cancer cases.

TABLE I.

	Ages 1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91	? age	Total
Tuberculosis negative. No cancer	42	... 47	... 64	... 82	... 98	... 106	... 131	... 57	... 16	... 1	... 20	664
Tuberculosis negative. Cancer	1	... 6	... 1	... 15	... 21	... 24	... 36	... 21	... 3	... 0	... 1	129
Tuberculosis positive, active, cause of death. No cancer	7	... 12	... 29	... 26	... 34	... 19	... 11	... 4	... 0	... 0	... 4	146
Tuberculosis positive. Cancer	—	—	—	—	—	—	—	1	—	—	—	1
Tuberculosis positive, slight cancer	—	—	—	4	... 3	... 11	... 12	... 11	... 12	... 7	... 3	0
Tuberculosis positive, slight. Cancer positive	—	—	—	—	—	—	—	3	... 5	... 2	... 1	—
Tuberculosis positive, healed. No cancer	—	—	—	4	... 14	... 18	... 35	... 39	... 38	... 28	... 11	0
Tuberculosis positive, healed. Cancer	—	—	—	—	—	—	2	... 5	... 3	... 9	... 4	—
Tuberculosis? No malignancy	—	—	2	... 5	... 5	... 9	... 14	... 24	... 3	... 4	—	1
Tuberculosis? Cancer	—	—	—	—	—	—	—	2	... 2	—	—	—

1,305

TABLE II.

	Ages 41-50	51-60	61-70	71 and over	
Tuberculosis negative	... 119 (cancer 21)	... 180 (24)	... 167 (36)	... 98 (24)	= 514 (105)
Tuberculosis healed	... 40 (cancer 5)	... 42 (3)	... 47 (9)	... 43 (4)	= 172 (21)   297 (33)
Tuberculosis active	... 49 (cancer 3)	... 35 (5)	... 26 (3)	... 15 (1)	= 125 (12)

An inspection of these Tables, especially of the second, would seem to suggest that persons who have had an active or a perfectly healed tuberculous lesion are less liable to develop (and die from) a malignant growth than those perfectly free from tuberculosis. But we have already indicated the fallacy that arises in the case of a patient with an active and killing tuberculous lesion, even when occurring at the cancer age. The tuberculous lesion progresses so rapidly that the chances are against a malignant growth developing in the short space of time available. In only one case out of 147 in which the patients died from active and extensive tuberculosis was a malignant growth found.

The position is quite otherwise with "healed tuberculosis." Here the cases are parallel with those "free from tuberculosis." We find that while in less than one in eight of the "healed" cases, malignant growths developed, more than one in five of those free from tuberculosis showed their presence. This seems to suggest, if the figures are sufficiently large to warrant any deduction at all, that for some reason, a person who has had a small focus of tuberculosis which has been completely overcome but has left evidence of its presence, is less liable to develop a malignant growth when he reaches the cancer age than a person who is perfectly free from any sign of tuberculosis, though this does not necessarily mean that

tubercle bacilli had never been present in such a person's tissues. If further data which we are collecting (and we hope others will collect data along these lines) show that these results are not merely accidental, we will have to search for an explanation. It may be that a tuberculous invasion, present or past, in some way tends to prevent or delay the development of a malignant growth in old age. It may be that the type of tissue which can successfully overcome a tuberculous lesion is also the type which can control, more successfully than the tissues in the tuberculosis negative cases, cells that are tending to become cancerous and invasive. If the tuberculous invasion, successfully overcome, has added to the individual's make-up some anti-cancerous factor, this may open the way to the detection of other measures by which added resistance to the development of malignant growths may be established.

### **Ulcer-Cancer and Carcinoma of the Intestine.**

By W. D. NEWCOMB, M.B.

THE relationship between peptic ulcer and gastric carcinoma is of more than academic importance. Some 10,000 persons die annually in England and Wales from carcinoma of the stomach, and, if it could be shown that an appreciable proportion of these arose in pre-existing peptic ulcers, a very strong case could be made for surgical treatment of this latter condition. On the other hand, the medical treatment of gastric ulcer is so satisfactory that unless there is a real risk of carcinoma supervening, most people would hesitate to advocate wholesale gastrectomy for simple ulcers. Unfortunately there is no agreement as to the frequency with which carcinoma arises in peptic ulcers. There are, on the one hand, Zenker (1882), who stated that all gastric carcinomata arose in peptic ulcers, and Wilson and MacCarty (1909), who give 71 per cent. as the figure; on the other hand are Bennett (1928), who says it never occurs, and Dible (1925), who gave 6 per cent. as his estimate.

It is not easy to give an explanation of such extreme variations of opinion, but undoubtedly they are due in part to a lack of definite criteria for the diagnosis of the pre-existence of a peptic ulcer in gastric carcinoma. Various observers use different methods, but more recently five points have been especially considered. The first is the clinical history. It is difficult for a morbid anatomist to evaluate this point correctly. However carefully obtained, clinical histories are not infallible. The other points are histological and are well described by Stewart (Hurst and Stewart, 1929). They are :—

- (1) Complete destruction of the muscularis in the centre of the ulcer.
- (2) An area of dense fibrosis in the base of the ulcer.
- (3) Fusion of the muscularis mucosæ and muscularis at the margin of the ulcer.

- (4) Presence of endarteritis obliterans in vessels around.

Stewart considers that they are arranged in the order of their diagnostic importance. Points 1 and 2 he considers very valuable. No. 3 was first brought forward by Turnbull, and has been previously demonstrated to this Section, December 7, 1926, and shown in Pannett's book (1926). They are illustrated in the figures (p. 20).

Fig. 1 shows a typical healing gastric ulcer and illustrates all four points; Fig. 2 shows an ulcerated carcinoma in which none of the criteria are present; Fig. 3 shows an undoubted ulcer-cancer in which all four points are present. The history also was typical :—

Female patient, aged 30.

Six years ...	...	...	Attacks of pain after food.
Three years ...	...	...	X-ray showed penetrating ulcer of lesser curvature.
Five months ...	...	...	Pain worse and continuous.

Previously, in considering these criteria, the discussion has been confined to gastric lesions and no attempt has been made to obtain control observations by applying them to other parts of the alimentary canal where peptic ulcers are unknown. The table below shows the results of such an application to a series of 112 consecutive cases of carcinoma of the intestine removed surgically at St. Mary's Hospital in the

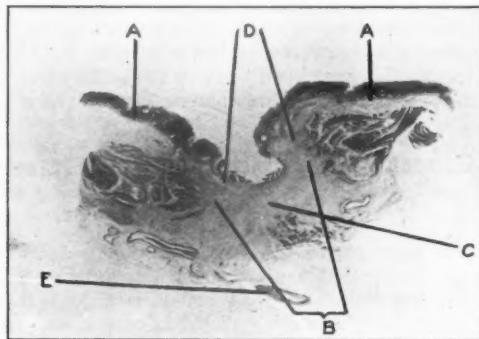


FIG. 1.—Healing peptic ulcer. (A) Muscularis mucosae. (B) Area in which muscularis is destroyed. (C) Area of dense fibrosis. (D) Points of fusion between muscularis mucosae and muscularis. (E) Vessel with endarteritis.

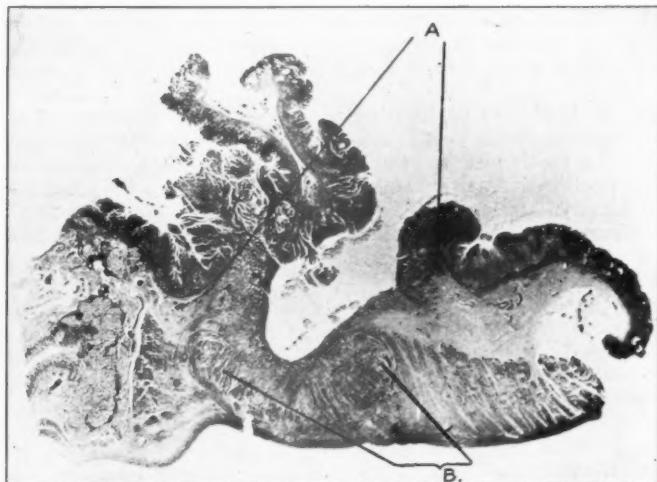


FIG. 2.—Ulcerated carcinoma of stomach. (A) Muscularis mucosae thrown up by carcinoma in submucosa. (B) Carcinoma in muscularis between but not destroying muscle fibres.

last ten years. 12 cases were neglected, as insufficient material was received for a complete examination. Material consisted usually of small pieces of growth removed for confirmation of diagnosis before radium treatment. 98 specimens were of large gut and 2 of ileum.

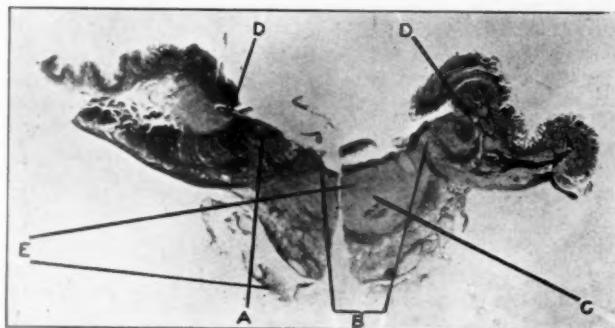


FIG. 3.—Ulcer-cancer of stomach. (A) Carcinoma on one side of ulcer only. (B) Area in which muscularis is destroyed. (C) Area of dense fibrosis. (D) Points of fusion between muscularis and muscularis mucosæ. (E) Vessels with endarteritis.

#### 100 CARCINOMATA OF INTESTINE.

Muscle in base	... ... ...	Present	94	...	Absent	...	6	
Fibrosis	... ... ...	Slight or absent	79	...	Moderate	10	Marked	11
Muscularis and muscularis mucosæ	... ... ...	Separated	94	...	Unchanged	6	Fused or closely approximated	0
Endarteritis	... ... ...	Absent	84	...	—	—	Present	16

Generally only one of the criteria was present at a time, but 3 cases showed marked fibrosis and endarteritis. Two showed marked fibrosis and destruction of muscle, while 2 cases presented three of the criteria, viz.: destruction of muscle, much fibrosis and endarteritis. One of these is seen in fig. 4.

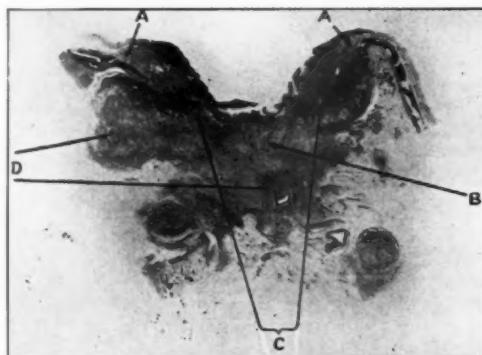


FIG. 4.—Carcinoma of large intestine. (A) Carcinoma growing in submucosa and separating muscularis and muscularis mucosæ. (B) Area of dense fibrosis in centre of ulcer. (C) Muscularis completely destroyed between the points. (D) Vessels showing endarteritis.

The only point against this being an ulcer-cancer is the separation of the muscularis mucosæ from the muscularis at the edge of the ulcer. From these results it would appear that the only certain criterion for the diagnosis of ulcer-cancer is fusion

of the muscularis mucosæ with the muscularis at the edge of the ulcer, each of the other suggested criteria being present in at least 6 per cent. of the control cases.

Both Stewart and Dible in their series of ulcer-cancers have excluded certain cases because of their short histories. This can only mean that they have not complete faith in their histological diagnosis. Any pathologist examining a piece of tissue which appeared syphilitic and in which he had demonstrated *Spirochæta pallida* would diagnose syphilis whatever the history. It is suggested that fusion of the muscularis mucosæ with the muscularis is as important a point in the diagnosis of ulcer-cancer as the finding of spirochætae in syphilis.

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